

# FY 2008

## Performance Evaluation Report



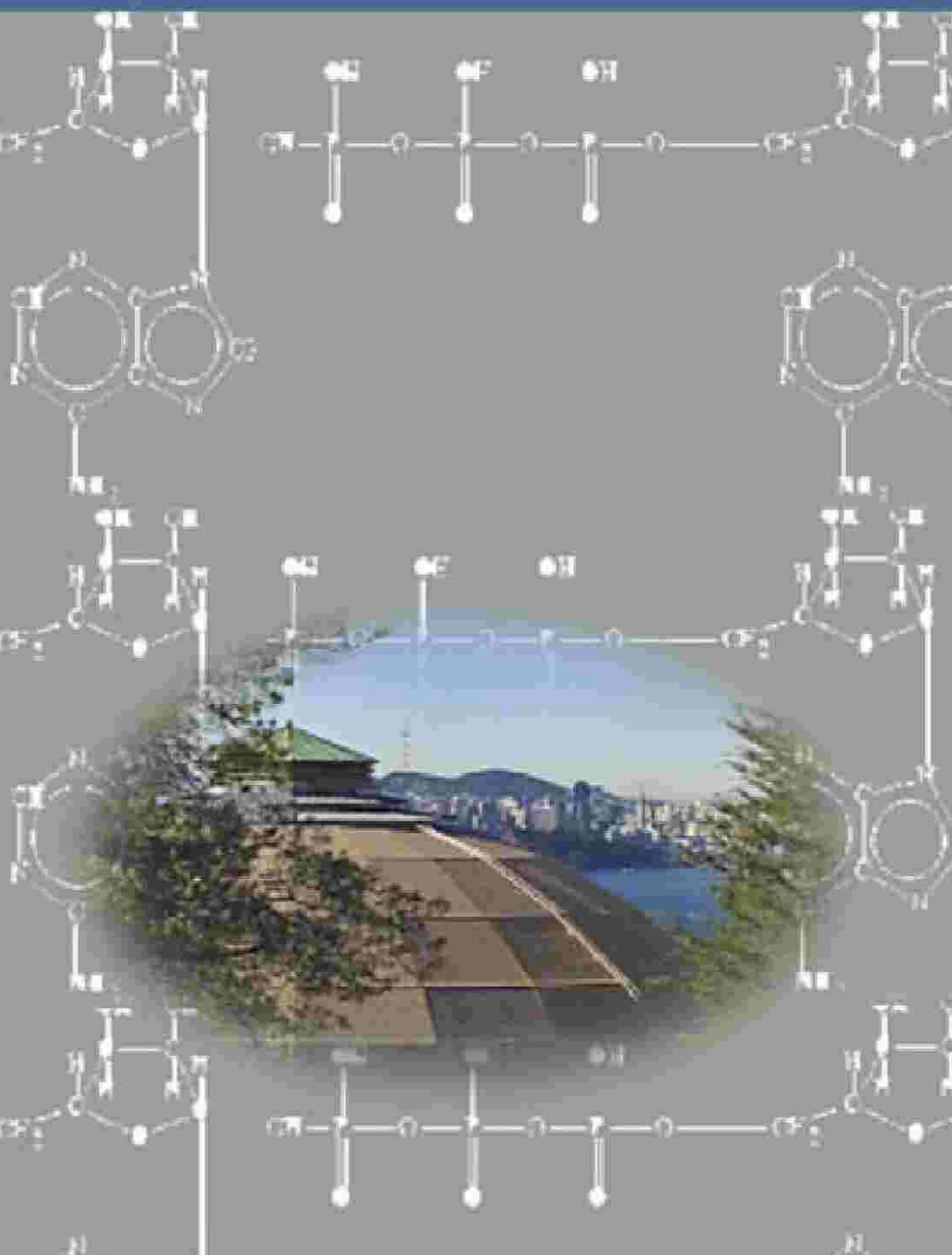
## *Lawrence Berkeley National Laboratory*



U.S. DEPARTMENT OF  
**ENERGY**

Prepared by:  
U.S. Department of Energy  
Office of Science  
Berkeley Site Office

February 2009



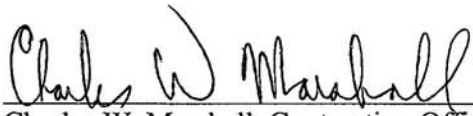




## CONTRACTING OFFICER'S EVALUATION

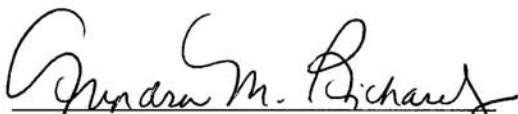
The Department of Energy, Berkeley Site Office Senior Management reviewed and discussed the recommendations of functional managers and staff concerning the appropriate numeric scores and grades with which to rate the University of California's performance in the management and operation of the Lawrence Berkeley National Laboratory. Based upon this process, an overall score of 3.7 with a grade of "A-" is recommended for the Science and Technology component of the evaluation. An overall score of 3.2 with a grade of "B+" is recommended for the Management and Operation component of the evaluation. These recommendations have been forwarded to and considered by the Office of Science and approved. This report, entitled *FY 2008 Performance Evaluation of The Regents of the University of California for the Management and Operations of the Ernest Orlando Lawrence Berkeley National Laboratory* provides the basis for my determination, and is hereby endorsed and approved.

Recommendation:

  
Charles W. Marshall, Contracting Officer  
Department of Energy  
Berkeley Site Office

Date: Jan. 30, 2009

Approval:

  
Aundra M. Richards, Site Manager  
Department of Energy  
Berkeley Site Office

Date: February 2, 2009





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## I. OVERALL SUMMARY RATING/FEE

### Performance-Based Score and Adjectival Rating:

The basis for the evaluation of The Regents of the University of California (the Contractor) for the management and operations of the Ernest Orlando Lawrence Berkeley National Laboratory (the Laboratory) during FY2008 centered on the Objectives found within the following Performance Goals:

- 1.0 Provide for Efficient and Effective Mission Accomplishment (Quality, Productivity, Leadership, & Timeliness of Research and Development)
- 2.0 Provide for Efficient and Effective Design, Fabrication, Construction and Operations of Facilities
- 3.0 Provide Effective and Efficient Science and Technology Research Project/Program Management
- 4.0 Provide Sound and Competent Leadership and Stewardship of the Laboratory
- 5.0 Sustain Excellence and Enhance Effectiveness of Integrated Safety, Health, and Environmental Protection
- 6.0 Deliver Efficient, Effective, and Responsive Business Systems and Resources that Enable the Successful Achievement of the Laboratory Mission(s)
- 7.0 Sustain Excellence in Operating, Maintaining, and Renewing the Facility and Infrastructure Portfolio to Meet Laboratory Needs
- 8.0 Sustain and Enhance the Effectiveness of Integrated Safeguards and Security Management (ISSM) and Emergency Management Systems

Each Performance Goal was composed of two or more weighted Objectives and most Objectives had a set of performance measures, which assisted in determining the Contractor's overall performance in meeting that Objective. Each of the performance measures identified significant activities, requirements, and/or milestones important to the success of the corresponding Objective. The following describes the methodology utilized in determining the Contractor performance rating.

Each Objective within a Goal was assigned a numerical score by the evaluating office. Each evaluation measured the degree of effectiveness and performance of the Contractor in meeting the Objective and was based on the Contractor's success in meeting the set of Performance Measures/Targets identified for each Objective as well as other performance information available to the evaluating office from other sources to include, but not limited to, the Contractor's self-evaluation report, operational awareness (daily oversight) activities; "For Cause" reviews (if any); other outside agency reviews (OIG, GAO, DCAA, etc.), and the annual 2-week review (if needed). If no performance measures/targets were utilized the description of the general expectations for the success of the objective was utilized as the baseline of the effectiveness and performance of the Contractor in meeting the corresponding Objective and in determining the score assigned. The Goal score was then computed by multiplying the numerical score by the weight of each Objective within a Goal. These values were then added together to develop an overall score for each Goal. This score was then compared to Table A to determine the overall grade for each Goal. A set of tables is provided at the end of each Performance Goal section of this document to assist in the calculation of Objective scores to the Goal score. The raw score (rounded to the nearest hundredth) from each calculation was carried through to the next stage of the calculation process. The raw score for Science and Technology and Management and Operations was rounded to the nearest tenth of a point for utilization in determining fee as discussed below. A standard rounding convention of x.44 and less rounds down to the nearest tenth (here, x.4), while x.45 and greater rounds up to the nearest tenth (here, x.50).

Final Grade	A+	A	A-	B+	B	B-	C+	C	C-	D	F
Total Score	4.3-4.1	4.0-3.8	3.7-3.5	3.4-3.1	3.0-2.8	2.7-2.5	2.4-2.1	2.0-1.8	1.7-1.1	1.0-0.8	0.7-0



**Table A. FY2008 Contractor Letter Grade Scale**

Based on the evaluation of *The Regents of the University of California's* performance against the Goals and Objectives contained within the FY2008 Performance Evaluation and Measurement Plan (PEMP) the scores and corresponding grades awarded for each are provided within Table B below. Specific information regarding the Contractor's performance in meeting each of the Goals and their corresponding Objectives is provided within Section II of this report.

S&T Performance Goal	Numerical Score	Letter Grade	Weight	Weighted Score	Total Score
1.0 Mission Accomplishment	3.7	A-	35.4%	1.31	
2.0 Design, Fabrication, Construction and Operations of Facilities	3.8	A	40.7%	1.55	
3.0 Science and Technology Research Project/Program Management	3.4	B+	23.9%	0.81	
<b>Total Score</b>					3.7
M&O Performance Goal	Numerical Score	Letter Grade	Weight	Weighted Score	Total Score
4.0 Leadership and Stewardship of the Laboratory	3.5	A-	25%	0.88	
5.0 Integrated Safety, Health, and Environmental Protection	2.6	B-	22%	0.58	
6.0 Business Systems	3.6	A-	25%	0.89	
7.0 Operating, Maintaining, and Renewing Facility and Infrastructure Portfolio	2.9	B	20%	0.57	
8.0 Integrated Safeguards and Security Management and Emergency Management Systems	3.4	B+	8%	0.27	
<b>Total Score</b>					3.2

**Table B. FY2008 Contractor Evaluation Score Calculation**

Performance-Based Fee Earned:

Utilizing Table B, above, the scores for each of the Science and Technology (S&T) Goals and Management and Operations (M&O) Goals were multiplied by the weight assigned and these were summed to provide an overall score for each. The percentage of the available performance-based fee that was earned by the Contractor was determined based on the overall weighted score for the S&T Goals (see Table B.) and then compared to Table C. below. The overall numerical score of the M&O Goals from Table B. was then utilized to determine the final fee multiplier (see Table C.), which was utilized to determine the overall amount of performance-based fee earned for FY2008 as calculated within Table D. Based on the overall performance within the S&T and M&O Goals the Contractor is awarded \$4,365,000 in performance based fee for FY2008.





Overall Weighted Score from Table A.	Percent S&T Fee Earned	M&O Fee Multiplier
4.3	100%	100%
4.2		
4.1		
4.0	97%	100%
3.9		
3.8		
3.7	94%	100%
3.6		
3.5		
3.4	91%	100%
3.3		
3.2		
3.1		
3.0	88%	95%
2.9		
2.8		
2.7	85%	90%
2.6		
2.5		
2.4	75%	85%
2.3		
2.2		
2.1		
2.0	50%	75%
1.9		
1.8		
1.7	0%	60%
1.6		
1.5		
1.4		
1.3		
1.2		
1.1		
1.0 to 0.8	0%	0%
0.7 to 0.0	0%	0%

Table C. – Performance-Based Fee Earned Scale

Overall Fee Determination	
Percent S&T Fee Earned from Table C.	94%
M&O Fee Multiplier from Table C.	100%
Overall Earned Performance-Based Fee	94%

Table D. – Final Percentage of Performance-Based Fee Earned Determination



Performance Fee and Rating Adjustment Factor:

There was no performance fee and adjustment factor utilized for the FY2008 rating period.

Performance Adjustment Determination	
Percent Fee Earned from Table D.	94%
Percentage of Performance Adjustment	0
Final Percentage of Fee Earned	94%
Final Performance Grade Awarded	

**Table E. Performance Adjustment Factor Calculation**

Based on the performance determination the Contractor is awarded \$4,230,000 in performance based fee for FY2008.



## II. PERFORMANCE GOALS, OBJECTIVES, AND MEASURES/TARGETS

For Science and Technology the format used by the program offices did not compute overall scores for all programs at the objective level, only at the goal level. Therefore no overall score and rating is identified at the objective level.

### 1.0 Provide for Efficient and Effective Mission Accomplishment (Quality, Productivity, Leadership, & Timeliness of Research and Development)

The Contractor produces high-quality, original, and creative results that advance science and technology; demonstrates sustained scientific progress and impact; receives appropriate external recognition of accomplishments; and contributes to overall research and development goals of the Department and its customers.

The weight of this Goal is 35.4%.

The performance evaluation narrative for goal 1.0 and its objectives is found at Appendix A and B of this report.

#### 1.1 Science and Technology Results Provide Meaningful Impact on the Field

Program	Page #
ASCR	A-3
BER	A-11
BES	A-18
FES	A-24
HEP	A-28
NP	A-33
WDTS	A-37
EERE	B-9
RW	B-31
FE	B-37

#### 1.2 Provide Quality Leadership in Science and Technology

Program	Page #
ASCR	A-4
BER	A-12
BES	A-19
FES	A-25
HEP	A-28
NP	A-33
WDTS	A-37
EERE	B-9
RW	B-32
FE	B-37



### **1.3 Provide and sustain Science and Technology Outputs that Advance Program Objectives and Goals**

Program	Page #
ASCR	A-5
BER	A-12
BES	A-20
FES	A-25
HEP	A-28
NP	A-34
WDTS	A-38
EERE	B-9
RW	B-32
FE	B-37

### **1.4 Provide for Effective Delivery of Science and Technology**

Program	Page #
ASCR	A-5
BER	A-13
BES	A-20
FES	A-25
HEP	A-29
NP	A-34
WDTS	A-38
EERE	B-9
RW	B-33
FE	B-38



Science Program Office	Letter Grade	Numerical Score	Objective Weight	Weighted Score	Overall Score
<b>Office of Advanced Scientific Computing Research</b>					
1.1 Impact	A-	3.6	40%	1.44	
1.2 Leadership	A-	3.5	30%	1.05	
1.3 Output	A-	3.5	15%	0.53	
1.4 Delivery	B+	3.4	15%	0.51	
<b>Total</b>					3.53
<b>Office of Basic Energy Sciences</b>					
1.1 Impact	A	3.9	50%	1.95	
1.2 Leadership	A+	4.1	20%	0.82	
1.3 Output	A	3.9	15%	0.59	
1.4 Delivery	A	3.8	15%	0.57	
<b>Total</b>					3.93
<b>Office of Biological and Environmental Research</b>					
1.1 Impact	A	3.8	30%	1.14	
1.2 Leadership	A	3.8	20%	0.76	
1.3 Output	A	3.8	20%	0.76	
1.4 Delivery	A-	3.6	30%	1.08	
<b>Total</b>					3.74
<b>Office of Fusion Energy Sciences</b>					
1.1 Impact	B+	3.1	30%	0.93	
1.2 Leadership	B+	3.4	20%	0.68	
1.3 Output	B+	3.4	25%	0.85	
1.4 Delivery	B+	3.1	25%	0.78	
<b>Total</b>					3.24
<b>Office of High Energy Physics</b>					
1.1 Impact	A	3.8	30%	1.14	
1.2 Leadership	A	3.8	30%	1.14	
1.3 Output	A-	3.6	30%	1.08	
1.4 Delivery	A	3.8	10%	0.38	
<b>Total</b>					3.74
<b>Office of Nuclear Physics</b>					
1.1 Impact	A	3.8	35%	1.33	
1.2 Leadership	A-	3.7	25%	0.93	
1.3 Output	A-	3.7	25%	0.93	
1.4 Delivery	A-	3.6	15%	0.54	
<b>Total</b>					3.72
<b>Office of Workforce Development</b>					
1.1 Impact	B+	3.1	25%	0.78	
1.2 Leadership	B+	3.1	30%	0.93	
1.3 Output	B+	3.1	30%	0.93	
1.4 Delivery	B+	3.1	15%	0.47	
<b>Total</b>					3.10

**Table 1.1 - 1.0 SC Program Office Performance Goal Score Development**



Science Program Office	Letter Grade	Numerical Score	BA Weight	Weighted Score	Overall Score
Office of Advanced Scientific Computing Research	A-	3.53	28.6%	1.01	
Office of Basic Energy Sciences	A	3.93	27.8%	1.09	
Office of Biological and Environmental Research	A-	3.74	19.5%	0.73	
Office of Fusion Energy Sciences	B+	3.24	1.9%	0.06	
Office of High Energy Physics	A-	3.74	15.0%	0.56	
Office of Nuclear Physics	A-	3.72	7.0%	0.26	
Office of Workforce Development	B+	3.10	0.3%	0.01	
<b>Performance Goal 1 Total</b>					<b>3.72</b>

Table 1.2 - SC Program Office Overall Performance Goal Score Development

HQ Program Office	Letter Grade	Numerical Score	Objective Weight	Weighted Score	Overall Score
<b>Energy Efficiency and Renewable Energy</b>					
1.1 Impact	A-	3.7	35%	1.31	
1.2 Leadership	A-	3.7	35%	1.31	
1.3 Output	A-	3.7	15%	0.56	
1.4 Delivery	A-	3.7	15%	0.56	
<b>Overall EERE Total</b>					<b>3.73</b>
<b>Radioactive Waste Management</b>					
1.1 Impact	A+	4.2	25%	1.05	
1.2 Leadership	A	3.9	25%	0.98	
1.3 Output	A	3.8	25%	0.95	
1.4 Delivery	A	3.8	25%	0.95	
<b>Overall RW Total</b>					<b>3.93</b>
<b>Fossil Energy</b>					
1.1 Impact	A+	4.09	25%	1.02	
1.2 Leadership	A+	4.09	25%	1.02	
1.3 Output	A+	4.09	25%	1.02	
1.4 Delivery	A+	4.09	25%	1.02	
<b>Overall FE Total</b>					<b>4.09</b>

Table 1.3 - Other Program Office Performance Goal Score Development



HQ Program Office	Letter Grade	Numerical Score	BA Weight	Weighted Score	Overall Score
Office of Science	A-	3.72	87.2%	3.24	
Energy Efficiency and Renewable Energy	A-	3.71	9.4%	0.35	
Fossil Energy	A+	4.10	3.4%	0.14	
Performance Goal 1.0 Total					3.73

**Table 1.4 - Overall Performance Goal Score Development**

Total Score	4.3-4.1	4.0-3.8	3.7-3.5	3.4-3.1	3.0-2.8	2.7-2.5	2.4-2.1	2.0-1.8	1.7-1.1	1.0-0.8	0.7-0
Final Grade	A+	A	A-	B+	B	B-	C+	C	C-	D	F

**Table 1.5 – 1.0 Goal Final Letter Grade**



## 2.0 Provide for Efficient and Effective Design, Fabrication, Construction and Operations of Facilities

**The Contractor provides effective and efficient strategic planning; fabrication, construction and/or operations of Laboratory facilities; and is responsive to the user community.**

The weight of this Goal is 40.7%

The performance evaluation narrative for goal 2.0 and its objectives is found at Appendix A and B of this report.

### Objectives:

#### 2.1 Provide Effective Facility Design(s) as Required to Support Laboratory Programs

Program	Page #
ASCR	A-6
BER	A-14
BES	A-21
FES	A-25
HEP	A-29
NP	A-35
WDTS	A-38
EERE	B-19
RW	B-34

#### 2.2 Provide for the Effective and Efficient Construction of Facilities and/or Fabrication of Components

Program	Page #
ASCR	A-6
BER	A-14
BES	A-21
FES	A-25
HEP	A-30
NP	A-35
WDTS	A-38
EERE	B-19
RW	B-34

#### 2.3 Provide Efficient and Effective Operation of Facilities

Program	Page #
ASCR	A-7
BER	A-14
BES	A-21
FES	A-25
HEP	A-30
NP	A-35
WDTS	A-38
EERE	B-19
RW	B-34





## **2.4 Utilization of Facility to Grow and Support Lab's Research Base and External User Community**

Program	Page #
ASCR	A-7
BER	A-14
BES	A-22
FES	A-25
HEP	N/A
NP	A-35
WDTS	A-38
EERE	B-19
RW	B-34



Science Program Office	Letter Grade	Numerical Score	Objective Weight	Weighted Score	Overall Score
<b>Office of Advanced Scientific Computing Research</b>					
2.1 Effective Facility Designs	A-	3.7	10%	0.37	
2.2 Construction/Fabrication	B+	3.4	10%	0.34	
2.3 Operation of Facilities	A-	3.6	70%	2.52	
2.4 Support Research Base	B+	3.4	10%	0.34	
<b>Total</b>					3.57
<b>Office of Basic Energy Sciences</b>					
2.1 Effective Facility Designs	A	4.0	20%	0.80	
2.2 Construction/Fabrication	A	4.0	15%	0.60	
2.3 Operation of Facilities	A	4.0	50%	2.00	
2.4 Support Research Base	A	4.0	15%	0.60	
<b>Total</b>					4.00
<b>Office of Biological and Environmental Research</b>					
2.1 Effective Facility Designs			0%	0.00	
2.2 Construction/Fabrication			0%	0.00	
2.3 Operation of Facilities	A	3.9	90%	3.51	
2.4 Support Research Base	A-	3.6	10%	0.36	
<b>Total</b>					3.87
<b>Office of Fusion Energy Sciences</b>					
2.1 Effective Facility Designs			0%	0.00	
2.2 Construction/Fabrication			0%	0.00	
2.3 Operation of Facilities			0%	0.00	
2.4 Support Research Base			0%	0.00	
<b>Total</b>					
<b>Office of High Energy Physics</b>					
2.1 Effective Facility Designs	A-	3.6	50%	1.80	
2.2 Construction/Fabrication	B+	3.4	50%	1.70	
2.3 Operation of Facilities			0%	0.00	
2.4 Support Research Base			0%	0.00	
<b>Total</b>					3.50
<b>Office of Nuclear Physics</b>					
2.1 Effective Facility Designs			0%	0.00	
2.2 Construction/Fabrication			0%	0.00	
2.3 Operation of Facilities	A-	3.7	85%	3.15	
2.4 Support Research Base	A-	3.6	15%	0.54	
<b>Total</b>					3.69
<b>Office of Workforce Development</b>					
2.1 Effective Facility Designs			0%	0.00	
2.2 Construction/Fabrication			0%	0.00	
2.3 Operation of Facilities			0%	0.00	
2.4 Support Research Base			0%	0.00	
<b>Total</b>					

Table 2.1 - 2.0 SC Program Office Performance Goal Score Development



Science Program Office	Letter Grade	Numerical Score	BA Weight	Weighted Score	Overall Score
Office of Advanced Scientific Computing Research	A-	3.57	21.9%	0.78	
Office of Basic Energy Sciences	A	4.00	35.5%	1.42	
Office of Biological and Environmental Research	A	3.87	29.9%	1.16	
Office of High Energy Physics	A-	3.50	8.7%	0.30	
Office of Nuclear Physics	A-	3.69	4.0%	0.15	
Performance Goal 2 Total					3.81

Table 2.2 - SC Program Office Overall Performance Goal Score Development

HQ Program Office	Letter Grade	Numerical Score	Objective Weight	Weighted Score	Overall Score
Energy Efficiency and Renewable Energy					
2.1 Effective Facility Designs			0%	0.00	
2.2 Construction/Fabrication			0%	0.00	
2.3 Operation of Facilities	A-	3.7	100%	3.71	
2.4 Support Research Base			0%	0.00	
Total					3.71

Table 2.3 - HQ Program Office Performance Goal Score Development

HQ Program Office	Letter Grade	Numerical Score	BA Weight	Weighted Score	Overall Score
Office of Science	A	3.81	98.6%	3.76	
Energy Efficiency and Renewable Energy	A-	3.71	1.4%	0.05	
Performance Goal 2 Total					3.81

Table 2.4 - Overall Program Office Performance Goal Score Development

Total Score	4.3-4.1	4.0-3.8	3.7-3.5	3.4-3.1	3.0-2.8	2.7-2.5	2.4-2.1	2.0-1.8	1.7-1.1	1.0-0.8	0.7-0
Final Grade	A+	A	A-	B+	B	B-	C+	C	C-	D	F

Table 2.5 – 2.0 Goal Final Letter Grade



### 3.0 Provide Effective and Efficient Science and Technology Research Project/Program Management

**The Contractor provides effective program vision and leadership; strategic planning and development of initiatives; recruits and retains a quality scientific workforce; and provides outstanding research processes, which improve research productivity.**

The weight of this Goal is 23.9%

The performance evaluation narrative for goal 3.0 and its objectives is found at Appendix A and B of this report.

#### Objectives:

### 3.1 Provide Effective and Efficient Stewardship of Scientific Capabilities and Program Vision

Program	Page #
ASCR	A-8
BER	A-15
BES	A-22
FES	A-26
HEP	A-30
NP	A-36
WDTS	A-39
EERE	B-22
RW	B-34
FE	B-38

### 3.2 Provide Effective and Efficient Science and Technology Project/Program Planning and Management

Program	Page #
ASCR	A-8
BER	A-16
BES	A-23
FES	A-26
HEP	A-30
NP	A-36
WDTS	A-39
EERE	B-22
RW	B-34
FE	B-38

### 3.3 Provide Efficient and Effective Communications and Responsiveness to Customer Needs

Program	Page #
ASCR	A-9
BER	A-17
BES	A-23
FES	A-26
HEP	A-31
NP	A-36
WDTS	A-39



EERE	B-22
RW	B-34
FE	B-38



Science Program Office	Letter Grade	Numerical Score	Objective Weight	Weighted Score	Overall Score
<b>Office of Advanced Scientific Computing Research</b>					
3.1 Effective/Efficient Stewardship	B+	3.3	30%	0.99	
3.2 Project/Program Planning & Management	B	2.8	40%	1.12	
3.3 Communications and Responsiveness	B	3.0	30%	0.90	
<b>Total</b>					3.01
<b>Office of Basic Energy Sciences</b>					
3.1 Effective/Efficient Stewardship	A-	3.7	40%	1.48	
3.2 Project/Program Planning & Management	A-	3.5	30%	1.05	
3.3 Communications and Responsiveness	B+	3.2	30%	0.96	
<b>Total</b>					3.49
<b>Office of Biological and Environmental Research</b>					
3.1 Effective/Efficient Stewardship	A	3.9	20%	0.78	
3.2 Project/Program Planning & Management	A	3.8	30%	1.14	
3.3 Communications and Responsiveness	B+	3.1	50%	1.55	
<b>Total</b>					3.47
<b>Office of Fusion Energy Sciences</b>					
3.1 Effective/Efficient Stewardship	B+	3.1	35%	1.09	
3.2 Project/Program Planning & Management	B+	3.1	30%	0.93	
3.3 Communications and Responsiveness	B+	3.1	35%	1.09	
<b>Total</b>					3.10
<b>Office of High Energy Physics</b>					
3.1 Effective/Efficient Stewardship	A-	3.6	40%	1.44	
3.2 Project/Program Planning & Management	B+	3.1	40%	1.24	
3.3 Communications and Responsiveness	B	3.0	20%	0.60	
<b>Total</b>					3.28
<b>Office of Nuclear Physics</b>					
3.1 Effective/Efficient Stewardship	A	3.9	40%	1.56	
3.2 Project/Program Planning & Management	A-	3.7	40%	1.48	
3.3 Communications and Responsiveness	B+	3.4	20%	0.68	
<b>Total</b>					3.72
<b>Office of Workforce Development</b>					
3.1 Effective/Efficient Stewardship	B+	3.2	20%	0.64	
3.2 Project/Program Planning & Management	B+	3.2	40%	1.28	
3.3 Communications and Responsiveness	B+	3.4	40%	1.36	
<b>Total</b>					3.28

Table 3.1 – 3.0 SC Program Office Performance Goal Score Development



Science Program Office	Letter Grade	Numerical Score	BA Weight	Weighted Score	Overall Score
Office of Advanced Scientific Computing Research	B	3.01	20.3%	0.61	
Office of Basic Energy Sciences	A-	3.49	26.3%	0.92	
Office of Biological and Environmental Research	A-	3.47	27.6%	0.96	
Office of Fusion Energy Sciences	B+	3.10	2.2%	0.07	
Office of High Energy Physics	B+	3.28	16.0%	0.52	
Office of Nuclear Physics	A-	3.72	7.4%	0.28	
Office of Workforce Development	B+	3.28	0.2%	0.01	
<b>Performance Goal 3 Total</b>					3.36

**Table 3.2 – SC Program Office Overall Performance Goal Score Development**

HQ Program Office	Letter Grade	Numerical Score	Objective Weight	Weighted Score	Overall Score
<b>Energy Efficiency and Renewable Energy</b>					
3.1 Effective/Efficient Stewardship			50%	0.00	
3.2 Project/Program Planning & Management			25%	0.00	
3.3 Communications and Responsiveness			25%	0.00	
<b>Total</b>					3.75
<b>Fossil Energy</b>					
3.1 Effective/Efficient Stewardship	A	4.0	40%	1.60	
3.2 Project/Program Planning & Management	A	4.0	30%	1.20	
3.3 Communications and Responsiveness	A	4.0	30%	1.20	
<b>Total</b>					4.00

**Table 3.3 – 3.0 HQ Program Office Performance Goal Score Development**

HQ Program Office	Letter Grade	Numerical Score	BA Weight	Weighted Score	Overall Score
Office of Science	B+	3.36	90.9%	3.06	
Energy Efficiency and Renewable Energy	A	3.75	6.9%	0.26	
Fossil Energy	A	4.00	2.1%	0.09	
<b>Performance Goal 3.0 Total</b>					3.40

**Table 3.4 - Overall Performance Goal Score Development**

Total Score	4.3-4.1	4.0-3.8	3.7-3.5	3.4-3.1	3.0-2.8	2.7-2.5	2.4-2.1	2.0-1.8	1.7-1.1	1.0-0.8	0.7-0
Final Grade	A+	A	A-	B+	B	B-	C+	C	C-	D	F

**Table 3.5 – 3.0 Goal Final Letter Grade**



#### 4.0 Provide Sound and Competent Leadership and Stewardship of the Laboratory

**The Contractor's Leadership provides effective and efficient direction in strategic planning to meet the mission and vision of the overall Laboratory; is accountable and responsive to specific issues and needs when required; and corporate office leadership provides appropriate levels of resources and support for the overall success of the Laboratory.**

The weight of this Goal is 25%.

The Provide Sound and Competent Leadership and Stewardship of the Laboratory Goal measured the Contractor's Leadership capabilities in leading the direction of the overall Laboratory. It also measured the responsiveness of the Contractor to issues and opportunities for continuous improvement and corporate office involvement/commitment to the overall success of the Laboratory.

#### Executive Summary

For Goal 4.0, Lawrence Berkeley National Laboratory (LBNL) achieved a numerical score of **3.5**, the equivalent of a grade of **A-**. Goal 4.0 has three objectives with 11 measures.

#### 4.1 Provide a Distinctive Vision for the Laboratory and an Effective Plan for Accomplishment of the Vision to Include Strong Partnerships Required to Carry Out those Plans

The Laboratory's score for FY2008 under this performance objective is **3.9**, the equivalent of a grade of **A....**. Performance Objective 4.1 has six measures, each with associated target(s).

**The Laboratory Business Plan or Institutional Plan provides all required data in a clear and concise manner and is completed within established guidelines and schedules. The Laboratory Mission included in the plan provides a clear understanding of the distinctive characteristics of the Laboratory.**

LBNL developed its first "Annual Laboratory Plan" in FY2008 according to SC's guidance. It integrates mission, program and institutional elements of the previous Business Plan with site planning, facilities and infrastructure elements of the previous Ten-Year Site Plan. It contains five distinctive business lines (Understanding Energy & Materials through electron dynamics; S&T for Globally Sustainable Energy, Multiscale Science & Engineering of Complex Biosystems; Extreme-scale Computational Science; and Matter & Energy in the Universe), related science strategies and initiatives, and strategic site investments over the next decade (DOE programs, SC-SLI, UC contractor, and LBNL). Collectively, an unprecedented ~\$1B in facility and infrastructure investments are planned over the next decade, which would both seismically upgrade and modernize the entire laboratory for its current, diverse mission. An overview of the Plan was presented to S4 Orbach and the SC leadership team in HQ-FORS on April 29, 2008.

**Strategic partnerships are developed that demonstrate the Laboratory's leadership, leverage DOE resources, and support collaborative programs with other DOE laboratories and academic, and industry groups.**

LBNL continued to grow and develop its extensive research partnerships and collaborations, and notable FY2008 accomplishments follow. The build-out of the new EmeryStation East building was completed under budget and ahead of schedule in June 2008 to provide 60,000 sq ft of laboratory and office space for the Joint Bioenergy Institute (JBEI), an LBNL-led collaboration with SNLL, LLNL, UC Berkeley, UC Davis, and the Carnegie Institute for Science. The partner institutions moved into the space and JBEI implemented its first year of research on cellulosic biofuels. LBNL continued to lead the Joint Genome Institute (JGI), a national user facility and genomic science collaboration that includes LLNL, LANL, ORNL, PNNL, and Hudson Alpha (Stanford University). The JGI plays a unique role in sequencing the DNA and analyzing the genomes of DOE mission-relevant organisms, especially plants and micro-organisms, and has begun supporting DOE's Bioenergy Research Centers. LBNL also continued to lead the management of the NSF-sponsored Deep





Underground Science and Engineering Laboratory (DUSEL) at the Homestake mine in Lead, S.D. The facility now hosts an initial experiment: a long baseline neutrino program with an array of detectors receiving beams of neutrinos from Fermilab (Project X). LBNL leads six institutions (including ANL, ORNL, Uill-UC, FEI Corp. of Oregon, and CEOS of Germany) in the Transmission Electron Aberration-corrected Microscope (TEAM) Project. TEAM 0.5 commenced operations in FY08 and it is the most powerful in the world. The Molecular Foundry completed its second year of operations, and the user program continued to grow. Through FY08, nearly 300 proposals from 25 states and 11 countries have been approved, and over 400 researchers have used the Foundry. LBNL submitted three Energy Frontier Research Center (EFRC) proposals to HQ-SC, all of which include participants from other institutions, and participated in many more EFRC proposals across the country. These address grand-challenge science problems in ultra-fast spectroscopy to study light-harvesting systems, advanced nanomaterials for batteries, and nanoscale control of geologic CO<sub>2</sub>.

**Effectiveness of the Work-for-Others (WFO) planning, management, and reporting system that serves the needs of both LBNL and DOE, and facilitates the project approval process.**

LBNL met expectations in its planning and management of the Work For Others (WFO) program.

**Effectiveness in maintaining appropriate relations with the community to include providing for science education opportunities, outreach, and open and honest communications.**

LBNL developed a Communications Strategy to inform the lab staff, the local community, and the media about \$500 million in planned construction projects over the next six years. The Lab also communicated proactively with the City of Berkeley regarding planned demolition of the Bevatron, responding to the City Council members' questions, especially on the health and safety aspects of the project. In December 2007, LBNL entered into the *East Bay Green Corridor* partnership with UC Berkeley and four East Bay cities (Oakland, Berkeley, Emeryville, and Richmond). Its goal is to create a regional environmental hub and promote the East Bay as a nucleus of green research and manufacturing. LBNL's Center for Science and Engineering Education (CSEE) continued a broad range of educational outreach and mentorship programs for students and teachers at all levels. In FY08, CSEE hosted 5<sup>th</sup> grade classrooms from all 27 Berkeley public schools, partnered with UC and CSU in piloting a PreService Teachers Program aimed at preparing undergraduates in science and technology to become teachers, and mentored 70 undergraduates from across the U.S. and 18 teachers, each with an assigned lab scientist.

**Valued partnership in supporting the local counterintelligence office (CI) in implementing and maintaining successful CI plans and programs at the Lab through leadership and management effectiveness.**

LBNL met expectations in supporting the local counterintelligence (CI) office and maintaining an effective, site-specific CI plan and program.

**Develop a baseline during FY 2008 for understanding and trending the cost of doing business. In subsequent years, the baseline should serve as a constructive tool for understanding and communicating the levels of resources and support for the overall success of the Laboratory.**

LBNL met expectations in developing a baseline for understanding and trending its cost of doing business and in developing a strategy to increase investment in infrastructure while minimizing increases to the cost of doing business.

#### **4.2 Provide for Responsive and Accountable Leadership throughout the Organization**

The Laboratory's score for FY2008 under this performance objective is **2.9**, the equivalent of a grade of **B**. Objective 4.2 has three measures, each with associated target(s).

**Leadership maintains an effective assurance function with cognizance of robust feedback and improvement Assurance**



In early FY2008, an Issues Management Program was formally issued to support issues and corrective action management, root cause analysis, extent-of-condition and effectiveness reviews, data monitoring and analysis, lessons learned, and best practices. In FY2008, LBNL performed 13 root cause analysis reviews and 13 extent-of-condition reviews, all of which led to corrective actions designed to prevent recurrence. BSO has communicated concerns to LBNL about the quality of its causal analyses and extent-of-condition reviews, and the Laboratory is implementing process improvements including the use of external expertise. BSO has determined through assessments that the Laboratory's Technical Assurance Program (TAP) has significant shortcomings in discovering and relating to management issues concerning the laboratory's ISM implementation. The laboratory's assurance system also has not been identifying issues of significant concern to DOE to the Contract Assurance Council a group of senior contractor executives charged with overseeing contract compliance. Given these shortcomings the BSO cannot currently rely on the assurance system to self-identify issues of concern to the BSO.

**Leadership is committed to a Pervasive Safety Culture and strives for continuous safety performance improvement**

Director Chu focused on improving the "tone at the top" with a renewed focus on line management responsibility and accountability for ISM, and a goal of being "first in safety and first in science." The first agenda item at each monthly Division Director meeting is now a discussion about the Lab's safety culture. The leadership increased Laboratory ES&H resources \$2.4M in FY2008 to support construction project safety, 10CFR851 (Worker Safety) initiatives, upgrades to the Emergency Operations Center, shipment of legacy waste, training, and ergonomic injury prevention. In June, the Director ordered all divisions to conduct all-hands meetings to reinforce the importance of safety and the implementation of ISM Corrective Action Plan (CAP) actions. In response to DOE reviews in FY2008, LBNL produced CAPs for electrical safety, fire protection, biosafety, and ones for facility hazard categorization and nanomaterial safety were in progress. The Director formed a Traffic Safety Task Force (vehicles, pedestrians, bicycles) that resulted in many safety improvements throughout the site. Frequent safety communications/messages were included in the *Today at Berkeley Lab* articles (over 40 in FY08), and in displays in the cafeteria and around the Laboratory. For the year, LBNL achieved 98% compliance of Job Hazards Analysis (JHA) and 92% compliance for ES&H training. LBNL did not achieve the PEMP goals for injury rates in FY08 (TRC=1.62 and DART=0.78), but these were slight improvements from FY07 (2% and 6%, respectively). Incident data shows a reduction in the severity of injuries, and increased willingness to seek first aid. Notably, in August 2008, the Laboratory achieved three years without a single construction lost-time injury. BSO is concerned that it took the laboratory and senior management a very long time to arrive at the newfound emphasis on changing the safety culture and that this was months after the Site Manager conveyed the gravity of some of the weaknesses. Failure to maintain inventory controls threatened to move the lab out of radiological space into nuclear space. The lack of an adequate maintenance program has put employees at risk when riding the laboratory's buses and resulted in a power outage that affected 26 buildings which also places employees at risk. The DOE validation and verification of laboratory corrective actions found in many instances the corrections were made to the written system descriptions but that work wasn't always being done in accordance with the way it was described – implementation is spotty across the various divisions. For example many employees are unfamiliar with the JHA for their position. The changes made to the safety culture late in the performance year may prove beneficial at some point but did not happen in time to provide DOE with an assurance during this rating period that there was a pervasive or sustainable safety culture in existence at LBNL.

**The Contractor will demonstrate that its Senior Managers are kept informed about evolving cyber security risks and threats.**

LBNL met expectations in providing risk-focused cyber-security communications to LBNL senior management. Laboratory managers were sent briefings on cyber-security policy and the changing threat environment. CIO Rosio Alvarez sent all division directors and senior management a consolidated summary of key risk areas. A Level 1 email message was sent to the entire Laboratory highlighting the escalating threats for targeted phishing, and how to avoid the risks.



#### 4.3 Provide Efficient and Effective Corporate Office Support as Appropriate

The Laboratory's score for FY2008 under this performance objective is **3.6**, the equivalent of a grade of **A-**. Objective 4.3 has two measures, each with associated target(s).

##### **University Support of Programs, Business and other operations, including administration, finance, human resources, and facilities, and process and procedure improvements.**

UC senior managers increased their visits and communications with senior DOE and SC officials regarding LBNL. They also participated in visits to LBNL by senior DOE and other officials, including the visit by Chilean President Michelle Bachelet in June 2008. The UC Office of the President (UCOP) provided critical support to LBNL in FY2008 to better manage the inventory of sealed sources and other radioactive materials and ensure that all Laboratory facilities are below "nuclear facility" classification levels. Assistance from LLNL and LANL was arranged, including a de-inventory nuclear material storage that was shipped to the DOE Off-Site Source Recovery Program at LANL. UCOP supported ISM improvements at LBNL, was directly involved in the development of the annual ISM declaration, and participated in the BSO's verification and validation activities. UCOP provided a variety of HR support to LBNL including: the assembly of appointment and salary packages for the new Deputy Director, Associate Laboratory Director for Operations, and three Division Directors (Earth Sciences, Environmental Energy Technologies, and NERSC); labor relations agreements and responses to union strikes; and recruitment, training, retention, and retirement resources from UC programs. UCOP also continued to provide the Laboratory with legal, policy, and contract administration support, including developing MOUs with BSO for the management of UC and nonfederal projects within or adjacent to LBNL.

##### **The demonstrated accomplishment of the Contractor to conduct appropriate corporate oversight and assurance.**

The executive-level LBNL Advisory Board met in Nov. 2007 and April 2008 and focused on new senior personnel on the Laboratory's scientific and operations leadership team, new and proposed facilities and programmatic initiatives, issues such as overhead differentials with the UC Berkeley campus which may impact LBNL's participation in the BP-funded Energy Biosciences Institute (EBI) research, follow-up on the results of DOE's FY2007 performance assessment, and other topics. The Board's reports advise UC and LBNL leadership, and copies are made available to DOE. The UC Contract Assurance Council (CAC) meets monthly with agenda topics included areas of DOE concern, oversight of Laboratory performance against the contract measures and corrective actions, risk-based audit planning, and other assurance and support activities. As follow-up to the Mercury spill incident at the Molecular Foundry in Aug. 2007, UCOP formally contacted all UC campuses about the safety rules that university researchers must follow when working at LBNL.

ELEMENT	Letter Grade	Numerical Score	Objective Weight	Total Points	Total Points
<b>4.0 Effectiveness and Efficiency of Contractor Leadership and Stewardship</b>					
4.1 Provide a Distinctive Vision for the Laboratory and an Effective Plan for Accomplishment of the Vision to Include Strong Partnerships Required to Carry Out those Plans	A	3.9	40%	1.56	
4.2 Provide for Responsive and Accountable Leadership throughout the Organization	B	2.9	30%	0.87	
4.3 Provide Efficient and Effective Corporate Office Support as Appropriate	A-	3.6	30%	1.08	
<b>Performance Goal 4.0 Total</b>					<b>3.5</b>



**Table 4.1 – 4.0 Goal Performance Rating Development**

<b>Total Score</b>	<b>4.3- 4.1</b>	<b>4.0- 3.8</b>	<b>3.7- 3.5</b>	<b>3.4- 3.1</b>	<b>3.0- 2.8</b>	<b>2.7- 2.5</b>	<b>2.4- 2.1</b>	<b>2.0- 1.8</b>	<b>1.7- 1.1</b>	<b>1.0-0.8</b>	<b>0.7-0</b>
Final Grade	A+	A	A-	B+	B	B-	C+	C	C-	D	F

**Table 4.2 – 4.0 Goal Final Letter Grade**



## **5.0 Sustain Excellence and Enhance Effectiveness of Integrated Safety, Health and Environmental Protection**

The weight of this goal is 22 percent.

The Sustain Excellence and Enhance Effectiveness of Integrated Safety, Health, and Environmental Protection Goal measured the Contractor's overall success in preventing worker injury and illness; implementation of ISM down through and across the organization; and providing effective and efficient waste management, minimization, and pollution prevention.

For FY 2008, Goal 5.0, Lawrence Berkeley National Laboratory (LBNL) earned a numerical score of **2.6**, the equivalent of a grade of **B-** based on the targets and measures of the PEMP. Goal 5.0 has three objectives with a total of 9 measures. However, as stated in the PEMP the measures and targets are to be the primary though not exclusive source for performance information.

During this rating period LBNL continued to improve their institutional ISM program. LBNL management demonstrated a commitment to safety through increased ES&H resources, development of new safety programs and continued improvement in incident reporting. However, system weakness continued to be evident. BSO's final assessment of LBNL performance took into account the out-come of oversight activities and significant incidents that occurred during the rating period. BSO's planned assessment activities identified significant programmatic deficiencies in LO/TO, Fire Protection, Bio-safety and Facility Hazard Categorization. The outcome of these assessments not only identified the specific programmatic deficiencies but also highlighted significant problems with LBNL's assurance program. There was no evidence that LBNL's self assessment or technical assurance mechanisms were identifying programmatic deficiencies even though it was evident through incidents and BSO reviews that deficiencies existed. In some cases LBNL was slow to address the programmatic deficiencies or perform adequate casual analysis and extent of condition reviews.

LBNL demonstrated notable improvement in some areas of ISM by development and deployment of the job hazard analysis (JHA). Feedback and improvement was evident by the development and deployment of the Non-Construction Safety Assurance Program for Subcontractors, Vendors, and Guests. Large construction projects continued to perform very well with LBNL performing over 6,000 documented safety observations. LBNL demonstrated aggressive safety leadership when it formed the Directorate-Facilities-Site Access Task Force to address hazards during prolonged periods of construction; the JGI stand down and process improvement evaluation following a cluster of ergonomic injury; and development and implementation of the Project Management Plan for the ISMS and other ES&H corrective actions.

### **5.1 Provide a Work Environment that Protects Workers and the Environment**

The Laboratory's score for FY2008 under this performance objective is **1.4**, the equivalent of a grade of **C-**. Objective 5.1 has four measures, each with associated targets.

#### Environmental Compliance

There was an increase in environmental compliance issues in FY08 primarily due to the unauthorized release of soil from the Bldg 10 construction project. While the soil incident cost the Laboratory several hundred thousand dollars, the event could have had significantly greater impacts had the soil not been promptly retrieved from the offsite location and dealt with appropriately. This incident had significant impact on BSO's assessment of LBNL's overall performance in Goal 5. Other contributing events were two cooling tower water leaks and violations found during external regulatory inspections.

#### Radiological Incidents



There were two PAAA-reportable events in FY 2008. One was for deficiencies in the DOE-STD 1027 facility hazard categorization process and the other for deficiencies with training and notification of GERT. The deficiencies identified from the DOE STD 1027 review resulted in violations with 10 CFR 830 Subpart B and the declaration of a Category 3 Nuclear Facility. Many other significant problems were identified with facility hazard analysis, change control, categorization process, and the inventory control and accountability system. This assessment had significant impact on BSO's assessment of LBNL's overall performance in Goal 5.

#### Injury Case Rates

LBNL continued to aggressively pursue the largest contributor of recordable injury. This was evident by the aggressive approach taken at the JGI following a cluster of ergonomic injuries on the production line. Significant ES&H resources were provided to the JGI during their one month stand down and a complete process evaluation and redesign of procedures was completed to minimize high risk activities. Nevertheless, LBNL failed to meet the SC goals for recordable injuries.

#### Opportunity For Improvement

- The Facility Categorization Review identified that line management did not take responsibility for implementation of DOE requirements. LBNL should develop mandatory training for all LBNL managers and supervisors to educate them on their responsibilities regarding the implementation of the UC contract with DOE to manage LBNL
- LBNL should perform a periodic integrated gap analysis review of LBNL programs against existing DOE requirements with LBNL stakeholders, institutional contract assurance group and appropriate subject matter experts. Integrate risk management and planning to LBNL assurance mechanisms.
- Significant research buildings at LBNL should be treated as Facilities with each having a dedicated facility safety manager. Buildings that house multiple divisions do not adequately control co-located hazards without strong facility safety managers. Additionally, equipment used by multiple divisions within a facility/building may impact the facility's operating envelope – e.g. floor loading, combustible loading, electrical load, ventilation capability, fire suppression system effectiveness, etc...
- Most recordable injuries are a result of ISM failure. All recordable injuries should undergo a rigorous ISM review to improve ISM implementation within Divisions.

### **5.2 Provide Efficient and Effective Implementation of Integrated Safety, Health and Environment Management**

The Laboratory's score for FY2008 under this performance objective is **2.5**, the equivalent of a grade of **B-**. Objective 5.2 has three measures, each with associated targets. While performance against the measures would have suggested a higher grade should be given, the BSO had to consider the impact of several safety incidents and programmatic deficiencies identified through BSO oversight activities. These recurring incidents highlight gaps that exist in the implementation of ISM.

DOE reviews of electrical safety, fire protection, bio-safety and facility hazard categorizations indicated that LBNL ES&H programs were not compliant with applicable requirements. These reviews were reported through the PAAA noncompliance reporting system (10CFR 851 and 10CFR820). While LBNL developed corrective action plans based on a causal analysis and extent-of-condition reviews for each of these reports, the timeliness and quality of the original products were less than satisfactory. LBNL did eventually implement process improvements that improved the quality and consistency of causal analysis, extent-of-condition reviews and corrective action plans. BSO is optimistic that if these process improvements are continued, LBNL will experience significant decreases in noncompliance and overall improvement in safety performance.





BSO technical reviews also exposed significant weakness in Laboratory Assurance Systems. LBNL's Technical Assurance Program (TAP) failed to identify major programmatic non-compliances and did not focus on regulatory compliance. By the end of FY2008, LBNL had made significant improvements to the TAP and BSO is confident that the TAP will continue to improve.

LBNL experienced two events during FY 2008 that identified significant safety problems within the Laboratory infrastructure caused by poor maintenance. The first event was a large power outage that affected 26 buildings in January 2008. While the actual event was handled appropriately, some backup generators and emergency lighting systems failed to function during the outage. The causal analysis and extent of condition review identified that appropriate inspection and maintenance was not being performed on critical building safety systems. The second event occurred in September when the brakes on an LBNL shuttle bus failed. The incident investigation revealed significant programmatic deficiencies in the bus maintenance program. While LBNL aggressively responded to these two events with appropriate reviews and corrective action plans, BSO continues to be concerned about the safe operation of LBNL's infrastructure.

LBNL made significant improvements to the ISM for non-construction work performed by subcontractors, vendors, and guests as documented in PUB-3000. However, evidence suggests that it is not being consistently implemented through-out LBNL. Subcontractors are required to submit all required safety documentation and records before they begin working at LBNL. However once they begin working, problems remain with the day to day management and accountability of subcontractors. Examples include:

- Twice in the last 6 months, BSO personnel have found subcontractors not using standardized LO/TO locks as required;
- Four instances of fall protection violations were documented over the last 6 months, all personnel were subcontractors.
- Scaffolding subcontractor personnel removed signage and barriers posted in an ALS Radiation Area.

The three specific performance measure targets of Objective 5.2 were met or exceeded by

- JHQ training completion rate of 92%
- 98% of the affected staff having an active JHA
- Completion of all established MT CAP milestones

BSO's ISM effectiveness review performed in September, 2008 indicated that the JHA process was effectively implemented across the laboratory. Although the lab far exceeded their goal on this measure, it was evident through field interviews and document reviews that implementation issues such as programmatic changes and computer glitches forced most employees to complete the JHA at least twice to ensure changes were captured. In addition, HSS and BSO raised concerns about the lack of description of work statements in the JHAs early into the lab-wide implementation process. The decision was made by LBNL to continue with the JHA process and to have employees add complete descriptions of the work being performed to the JHA early in FY09.

#### Opportunities for Improvement

- An opportunity for improvement exists in evaluating the quality of the training classes. A technical assurance program or peer review system would provide additional feedback to instructors on teaching techniques, materials and course content. Also, during a recent audit BSO received a comment from a researcher regarding exam results from online courses. She stated that it would be helpful to students if the test results included the correct answers to missed questions instead of just the number of questions answered incorrectly. Even if they pass the course, it would be prudent to provide the correct answers to the material.
- LBNL should revisit their process for validation and ensure that an effectiveness review is conducted of the key action accomplishments at an appropriate time after completion of the actions. This step is essential to



the feedback and improvement process and to ensure that all improvements associated with the corrective action plan are not only completed but truly achieve the desired results.

- Division Safety Coordinators should be dedicated safety professionals. With few exceptions, the approach to safety at LBNL is to assign ES&H functions as a collateral duty to researchers, principal investigators, or to staff members who expresses an interest in the assignment. While this approach does have the benefit of providing peer review by technically competent personnel, it ignores the implicit conflict of interest between programmatic concerns (schedule, budget, resources) and safety. Another shortcoming of safety as a collateral duty is that the lack of independence from the work performed often results in 'blind spots' to safety issues. Safety would be better served if in addition to the collateral assignments, divisions had dedicated safety professionals
- DOE has set new expectations for rigorous implementation of ISM. LBNL should re-evaluate current organizational structure to determine if it is appropriate to meet these expectations.
- LBNL should include the drivers behind policy and procedure changes when information is relayed to employees so that they have a better understanding of why increased or new controls are necessary. A recent opportunity for this activity was the roll out of the nano-scale materials safety training program. The new requirements were conveyed to the researchers without giving them the reason as to why this new program has been initiated. Communicating the reason and rationale behind new initiatives can lead to increased understanding, awareness and acceptance.
- Lessons Learned and Best Practices should be shared throughout the complex in accordance with DOE O 210.2, the DOE Corporate Operating Experience Program. There was an observation during the February, 2008 review of the LBNL Contractor Assurance System that lessons learned and best practices had not been shared outside of LBNL
- There is no process to ensure the accuracy of the chemical management system (CMS). Compressed gas cylinders in laboratories and on loading docks are not consistently included in the Chemical Management System (CMS). Within the CMS there should be process to ensure the accuracy of CMS.

### **5.3 Provide Efficient and Effective Waste Management, Minimization, and Pollution Prevention**

The Laboratory's score for FY2008 under this performance objective is **3.5**, the equivalent of a grade of **A-**. Objective 5.3 has two measures, each with associated targets.

LBNL's environmental program performed well in FY08. BSO's assessment of the Radionuclide NESHAP program had no findings and there were three noteworthy practices. In addition there was a DTSC/City of Berkeley inspection of the Hazardous Waste Handling Facility in October and no violations were found. LBNL was able to do a greater number of radioactive waste shipments this year thereby reducing the curie inventory by 95%.

LBNL maintained their green rating for EMS. Although they did not achieve targeted energy savings for the EMS Project Energy Saving Measure they did achieve 7.4% which is well above the baseline goal of 3% and did complete the Sustainability Executable Plan.

LBNL completed ten projects to improve the environment. Most notable was the Petroleum Fuel Reduction project which reduced petroleum fuel by 24% from FY05 compared to 6% target, decreased size of fleet by 33% compared to FY00, increased electric cart fleet (GEMS) by 8 in FY08, and increased fleet of E85 vehicles.

#### Opportunities for Improvement





Additional staff resources for the NEPA Cultural Resources Programs at LBNL are needed. Non-DOE projects have negatively impacted the NEPA program. Corrective actions to the program have been significantly delayed. Significant workload increase from Seismic Phase II and BELLA is anticipated.

ELEMENT	Letter Grade	Numerical Score	Objective Weight	Weighted Score	Total Points
<b>5.0 Sustain Excellence and Enhance Effectiveness of Integrated Safety, Health and Environmental Protection</b>					
5.1 Provide a Work Environment that Protects Workers and the Environment.	C-	1.4	20%	0.28	
5.2 Provide Efficient and Effective Implementation of Integrated Safety, Health and Environmental Management	B-	2.5	50%	1.25	
5.3 Provide Efficient and Effective Waste Management, Minimization, and Pollution Prevention.	A-	3.5	30%	1.05	
<b>Performance Goal 5.0 Total</b>					<b>2.6</b>

**Table 5.1 – Goal 5.0 Performance Rating Development**

Final Grade	A+	A	A-	B+	B	B-	C+	C	C-	D	F
Total Score	4.3-4.1	4.0-3.8	3.7-3.5	3.4-3.1	3.0-2.8	2.7-2.5	2.4-2.1	2.0-1.8	1.7-1.1	1.0-0.8	0.7-0

**Table 5.2 – Goal 5.0 Final Letter Grade**



## **6.0 Deliver Efficient, Effective, and Responsive Business Systems and Resources that Enable the Successful Achievement of the Laboratory Mission(s)**

The Contractor sustains and enhances core business systems that provide efficient and effective support to Laboratory programs and its mission(s).

The weight of this Goal is 25 percent.

The Deliver Efficient, Effective, and Responsive Business Systems and Resources that Enable the Successful Achievement of the Laboratory Mission(s) Goal measured the Contractor's overall success in deploying, implementing, and improving integrated business system that efficiently and effectively support the mission(s) of the Laboratory.

For FY2008, LBNL achieved the target for Goal 6.0 by successfully demonstrating there are efficient and effective business systems in place to ensure meeting the mission of the Laboratory. For the five systems evaluated: financial management; acquisition and property management; human resource management; internal audit and information management; and, technology transfer and commercialization of intellectual assets, each objective score was given a weighting.

For FY2008 the combined numeric score is **3.7** which translates to a grade of **A-** and is based on the following accomplishments for each management system.

### **6.1 Provide an Efficient, Effective, and Responsive Financial Management System(s)**

Objective 6.1 is a measure of the effectiveness of the financial management systems of the Laboratory. A balanced scorecard model is used to measure performance in four activities: the ethics/governance/compliance activities; financial activities; people activities; and internal business activities. The balanced scorecard activities were determined in order to evaluate essential financial activities and required 86.8 points out of 100 points possible to be graded at the "meets expectations" (3.1 – 3.4 numeric score, B+ grade score) level.

#### **Financial Management**

LBNL achieved a numeric score of **3.4**, for a letter rating of "**B+**" for 2008 under the Financial Management functional area, meeting their target of a B+ score. Financial Management was evaluated under one measure focused on achievement of seven Balanced Scorecard Plan activities reflective of an effective Financial Management System. In evaluating the overall objective of the measure, BSO considered LBNL performance against the Balanced Scorecard, along with all other factors that ensure that LBNL has an efficient, effective and robust Financial Management System.

The Laboratory continues to improve its funds control practices, which includes the development of Phase II (Planning Module) of the new Budget and Planning System. Once implemented and used throughout the lab, the new system will provide for more improved funds control management and an enhanced planning and spending projection tool.

LBNL completed the corrective actions on audit findings and recommendations timely. The laboratory has relied on the Corrective Action Tracking System (CATS) to consistently track audit and review findings and corrective actions.

The Office of the Chief Financial Officer (OCFO) continued its efforts to review existing financial policies and procedures for the lab. The OFCO reviewed 30 policies to ensure each policy is compliant with Contract 31, applicable laws and regulations and Laboratory business practices. The Self-Assessment program was developed to assess practices, mitigate risk, provide assurance and identify opportunities for improvement. This year, The Non-Purchase Order (PO) Payment/Request for Issuance of Check (RFIC) process was selected and assessed. The self assessments produced final summary reports, identifying suggested improvements and any resulting corrective actions.



The OCFO continues to support the DOE system priorities and initiatives, by being diligent in supporting Standard Accounting and Reporting System (STARS), continuing to work through reconciliation issues, and maintaining financial integrity.

LBNL performance against the Financial Management Balanced Scorecard Plan produced a higher score than our final assessment of performance because there were several issues outside of the Balanced Scorecard Plan activities that raised notable concern.

#### Notable performance

The development of Phase II (Planning Module) of the new Budget and Planning System is a significant step to provide a comprehensive Budget and Planning process. With both funding and planned spending information in this system, this will provide an improved financial tool throughout the lab. However, the impact of the system to the lab will not be known until it is fully implemented throughout the lab for all budget information. Full implementation is expected in FY09.

The OFCO also developed and implemented several other systems. They implemented a new travel system (TREX), which is more user friendly and streamlines data entry and approvals. The cycle time for reimbursing travelers was reduced an average of 25%. An events database was also developed and implemented. Previously a manual and cumbersome process, this automated system electronically maintains and controls all laboratory events, such as conferences. It automates approvals and tracks costs and attendees.. Finally, an on-line web based registration process was developed and implemented for easier access to register for LBNL conferences. This process allows participants to sign up and pay for conferences, segregating between allowable registration fees as well as optional unallowable cost activities.

#### Concerns

An area of concern was the lack of financial oversight and review of a specific HQ financial data call. As a product representing the financial information and requests from LBNL, our expectation was for it to be complete and accurate when provided to us for review. However, we had to return it to the lab for revisions and corrections. In this instance, the existing OCFO review process failed to catch a human error.

During FY 2008,BSO completed a review of Conference Management. The review identified three recommendations. The most significant related to controls assuring that travelers deduct from per diem for meals furnished at conferences. Some travelers to conferences received full per diem, even though meals were provided at the event and included in the conference fees. Even though a new travel system (TREX) has been implemented and there are systematic tools and policies in place, the control for this issue is reliant on the travelers and their supervisors to ensure compliance with policy and that per diem has been adjusted accordingly. While it is a low cost control we have concerns about its effectiveness. There was also an issue on LBNL's Conference policy, how it collects fees and how they differentiate financially what is used for registration fees and optional unallowable costs, but this was corrected shortly into FY 2009 with the submission of revised policy to BSO for approval.

An area of both notable performance and concern was some "Self –Disclosed" unallowable cost issues. The notable performance is the willingness of the OCFO to self-disclose such issues. Since they were self-disclosed, they are not considered a deficiency. Because they are variances from good practice, BSO will continue to monitor corrective actions and ensure processes are in place to prevent identical occurrences in the future. These items include:

- Overcosting of excess lane charges at the JGI facility. These were previously charged to the "Directors Discretion" account whenever there was an overrun. A policy was established requiring prior approval to use the "Directors Discretion" account.
- Waiver of Added Factor (FAC). A WFO review determined several WFO agreements had inappropriately charged or omitted added factor. This issue is considered relatively minor as only five of approximately 2200 transactions had an error.



- Miscellaneous Costs. A financial review identified unallowable costs for travel claims, relocation, and late FICA payments.

LBNL ensured that financial activities comply with good financial management practices as evidenced in this year's results with some notable achievements and some financial issues we feel require additional process improvements and oversight.

We have considered all of the financial performance for this past year; including the results of the PEMP, notable achievements and our concerns. The resulting score is a numeric score of 3.4, the highest level of meeting our expectations, and a letter rating of B+.

## 6.2 Provide an Efficient, Effective, and Responsive Acquisition and Property Management System(s)

Objective 6.2 is a measure of the effectiveness of the procurement and property management systems of the laboratory. Each system uses a balanced scorecard model to measure performance in four perspectives: a customer perspective; internal business perspective; learning and growth perspective; and financial perspective. Each system used its own balanced scorecard based on the guidance from Headquarters and required 86.8 points out of 100 points possible to be graded at the "meets expectations" (3.1 – 3.4 numeric score, B+ grade score) level. Each system had a significant test of its integrity this year to establish that it does indeed exceed expectations. Procurement had a peer review that had no significant findings and Property had a wall-to-wall inventory that resulted in a find rate that exceeded standards. To obtain the overall objective score, the assessments for the two systems were averaged. The Laboratory's score for FY2008 under this performance objective is **3.4** which translates to a grade of **B+** and is based on the following accomplishments in each system:

### Acquisition Management (Procurement)

The FY 2008 Procurement Balanced Scorecard (BSC) indicates that the Procurement Department successfully supported the Laboratory mission, complied with statutes and regulations, and met or exceeded a majority of the targets. While the Laboratory continues to work towards meeting all of the socioeconomic targets, 4 of the 6 goals exceeded expectations. The Procurement organization was evaluated against measures detailed in the Procurement System Evaluation Plan and the four perspectives of the Balanced Score Card (BSC). These four perspectives are (1) Customer Satisfaction, (2) Internal Business Processes, (3) Learning and Growth, (4) Financial Aspects. Measures under each perspective were assigned points based upon the weight given each measure in terms of importance. Out of 100 points possible, the Laboratory achieved 98.5 points. Some of the areas which exceeded expectations are as follows:

#### Small Business Results:

	Goal	Achievement	Actual Dollars
Small Business	41.8%	53.7%	\$132.9 million
Small Disadvantaged Business	6.8%	7.1%	\$17.6 million
Women-owned Small Business	5.8%		
HubZone Small Business	2.2%	2.1%	\$1.2 million
Service Disabled Veteran Owned Small Business	1.3%	2.6%	\$6.3 million
Veteran Owned	1.0%	5.3%	

Obligations to socioeconomic concern categories were collectively almost \$73 million more than those in FY 2007. This has far exceeded expectations.

The Procurement Department continued to maintain a high level of customer satisfaction, cost efficiency and effectiveness, and adhered to accepted best business practices. The self-assessments performed during this



rating period, complied with the Procurement System Evaluation Plan, and showed no evidence of system deficiencies.

The Procurement Training Program is now fully deployed, without any significant weaknesses or gaps. Should this level of performance be sustained in the upcoming year, this area will be removed from the Balanced Score Card in FY 2010.

Lastly, the cost-to-spend ratio of 1.74%, far exceeding the minimum expected ratio of 2.75% set in the BSC.

The overall assessment of the Laboratory in the area of procurement is 98.5 points. The PEMP Score is 3.4. However given the areas of notable improvement mentioned above the Laboratory has earned a score of 3.6 which equates to an "A-".

#### Property Management

The FY 2008 Property Balanced Scorecard (BSC) indicates that the Property System is adequately operating to meet the mission of the Laboratory. The Property System was evaluated against measures detailed in the Balanced Score Card (BSC) against four perspectives: (1) Customer Satisfaction; (2) Internal Business Processes; (3) Learning and Growth; and (4) Financial Aspects. Measures under each perspective were assigned points based upon the weight given each measure in terms of importance. Out of 100 points possible, the Laboratory achieved 95.5 points. The Laboratory has performed a highly successful inventory program for sensitive items and equipment. However, a Stores inventory was not made a part of the process. The Laboratory disclosed having a storeroom during the last quarter of the rating period. During the week of November 17 through the 21 DOE made a visit to the storeroom, S79. While the place looks clean and ready for an inventory it has not occurred. Internal Audit did perform a review in this area, IAS 2625, which uncovered control weaknesses in the system. The Laboratory has already begun to correct the deficiencies. The Site Office will monitor how effective the corrective actions are next year.

The overall assessment for the Laboratory in this area is 95.5 points. The PEMP score is 3.2 which equates to a B+. The overall score for objective 6.2 is 3.4 which equates to a "B+".

### **6.3 Provide an Efficient, Effective, and Responsive Human Resources Management System**

The LBNL FY 2008 Human Resources (HR) performance objective 6.3 focused on operating an efficient, effective, and responsive HR System and moving the Laboratory towards National Academy of Public Administrators (NAPA) certification. LBNL HR proposed nine initiatives to pursue this year to accomplish the above measure.

As indicated in the self assessment, the following nine initiatives were substantially completed with no notable areas of increased or diminished performance identified:

1. Finalize the 3-year HR Strategic Plan,
2. Lead the performance management and salary planning processes in the Divisions,
3. Create, review, and revise HR policies on an established cycle,
4. Develop an employee handbook,
5. Comply with "Trafficking in Persons" Clause,
6. Design and implement a pilot on supervisory fundamentals for scientific and non-scientific supervisory development: "Fundamentals of Leading and Motivating People,"
7. Maintain Certified Compensation Program,
8. Track benefits statistics and assess employees' satisfaction with these services,
9. Standardize recruitment processes.

In addition to the nine initiatives that were completed, LBNL HR also initiated five programs of notable performance with laboratory-wide impact. These programs apply across the laboratory and require LBNL HR to attain senior management buy-in.

The first program of notable performance is succession planning. LBNL HR developed and implemented a Succession Planning program for division director positions that outlines critical competencies for these



positions, potential successors and high-potential talent. LBNL HR plans to expand the Succession Planning program to lower levels of management. The second program is the identification of five values, five organization competencies and five management competencies that provide a consistent foundation of expectations for all staff and management. These values and competencies will be incorporated into the performance-review process, assessment of candidates in recruitments and promotions, succession planning and the design of courses. The third program is the establishment of a Three-Year Strategic Learning Plan. The Plan helped LBNL accomplish integration of disparate learning activities. The fourth program is the Women Scientist Initiative. LBNL HR conducted an analysis of the challenges and obstacles faced by women scientists and researchers at the Lab and as a result, LBNL is focusing efforts on recruitment, retention and development of women scientists. The fifth and final program of notable performance is a formal project management approach. LBNL HR has instituted a formal project management approach in identifying issues, corrective actions and tracking status. LBNL HR exceeded expectations by initiating these five additional programs of laboratory-wide impact.

The Laboratory's rating for FY 2008 under objective 6.3 is **A (3.8)**. The Lab achieved the completion of all nine initiatives identified to operate an efficient, effective and responsive HR System and move the Lab towards NAPA certification. In addition, the Lab exceeded expectations and initiated five programs with Laboratory-wide impact.

#### **6.4 Provide Efficient, Effective, and Responsive Management Systems for Internal Audit and Oversight; Quality; Information Management; and Other Administrative Support Services as Appropriate**

The Laboratory's score for FY2008 under this performance objective is **3.6** which equates to a letter grade of **A-**. While performance against the measures would have suggested a higher grade should be given, the BSO had to consider the overall impact of performance in relation to the PEMP requirement that "A+" grades have: "Areas of notable performance have or have the potential to significantly improve the overall mission of the Laboratory. No specific deficiency noted within the purview of the overall Objective being evaluated."

Internal Audit has exceeded all of its balanced scorecard performance targets for FY2008. It has put into place a survey process that requested feedback from the users of its products and exceeded expectations by requesting feedback within five days of audit issuance and following up with customer feedback as appropriate. Internal Audit has been receptive to BSO feedback on some of its audits. It has responded quickly to these comments and has had constructive discussions with the BSO. Internal Audit exceeded expectations by achieving 125 percent of audit plan expectations for FY2008 including eight efficiency recommendations that were issued against an expectation for three recommendations. Direct hours effort for FY2008 was over planned percentage (plan 88.2 percent, actual 89.4 percent) which exceeded expectations of no less than 5 percent below plan and all audit staff completed the training hours required to maintain their professional certifications, again exceeding expectations that all but one would do so.

LBNL's Information Management has continued to perform well by exceeding the target score of 85 points on the IT Scorecard with a score of 93 points. This performance has enabled an environment of productive science and operations. This was reflected by the following examples:

Telephone services, excluding the inflation-adjusted labor rate increase, still remains on a downward trend in cost per service calls.

Because of LBNL's strong performances in both network connectivity and availability for business systems, which was close to perfect, this allowed scientists and operations to continue functioning without significant interruptions. In FY08, KPMG/IG-FISMA conducted an intensive audit of business system at LBNL in which there were no major issues discovered.

Helpdesk functions also exceeded it's rating by obtaining 9.76 points out of 10. This was based on 1690 helpdesk ticket responses.

#### **6.5 Demonstrate Effective Transfer of Technology and Commercialization of Intellectual Assets**





The Laboratory's score for FY2008 under this performance objective is **3.9** which equates to a letter grade of **A**. Fifty-three technologies were written and posted, forming 42 Technology Announcements in FY 2008, far exceeding the target.

Technology Transfer changed its strategy this year, emphasizing the marketing of technologies earlier in their development. With the explosion of Internet use, a larger fraction of companies and entrepreneurs are finding LBNL technologies to license and commercialize through use of search engines. By writing a business-oriented technology description and posting it on the Technology Transfer Web site, LBNL is expanding the potential market for each technology; by making the technologies available earlier in their development, they increase the time the companies have to evaluate the technology before additional expensive patent coverage is required. It is difficult to point to an outcome (e.g., more products or even more licenses) as the impact may not be seen until years later.

ELEMENT	Letter Grade	Numerical Score	Objective Weight	Total Points	Total Points
<b>6.0 Deliver Efficient, Effective, and Responsive Business Systems and Resources that Enable the Successful Achievement of the Laboratory Mission(s)</b>					
6.1 Provide an Efficient, Effective, and Responsive Financial Management System(s)	B+	3.4	30%	1.02	
6.2 Provide an Efficient, Effective, and Responsive Acquisition and Property Management System(s)	B+	3.4	30%	1.02	
6.3 Provide an Efficient, Effective, and Responsive Human Resources Management System	A	3.8	20%	0.76	
6.4 Provide Efficient, Effective, and Responsive Management Systems for Internal Audit and Oversight; Quality; Information Management; and Other Administrative Support Services as Appropriate	A-	3.7	10%	0.37	
6.5 Demonstrate Effective Transfer of Technology and Commercialization of Intellectual Assets	A	3.9	10%	0.39	
<b>Performance Goal 6.0 Total</b>					<b>3.56</b>

**Table 6.1 – 6.0 Goal Performance Rating Development**

Total Score	4.3-4.1	4.0-3.8	3.7-3.5	3.4-3.1	3.0-2.8	2.7-2.5	2.4-2.1	2.0-1.8	1.7-1.1	1.0-0.8	0.7-0
Final Grade	A+	A	A-	B+	B	B-	C+	C	C-	D	F

**Table 6.2 – 6.0 Goal Final Letter Grade**



## **7.0 Sustain Excellence in Operating, Maintaining, and Renewing the Facility and Infrastructure Portfolio to Meet Laboratory Needs**

**The Contractor provides appropriate planning for, construction and management of Laboratory facilities and infrastructures required to efficiently and effectively carry out current and future S&T programs.**

The weight of this Goal is 20%.

The Sustain Excellence in Operating, Maintaining, and Renewing the Facility and Infrastructure Portfolio to Meet Laboratory Needs Goal measured the overall effectiveness and performance of the Contractor in planning for, delivering, and operations of Laboratory facilities and equipment needed to ensure required capabilities are present to meet today's and tomorrow's complex challenges.

The rating for Goal 7.0 is **2.9 (B)**. Objective 7.1 is rated 2.3 (C+) and Objective 7.2 is rated 3.4 (B+). Noteworthy performance includes assembly of a strong project management team and early successes for the B51 & Bevatron Demolition Project and leadership supporting the Science Laboratories Infrastructure (SLI) Modernization initiative.

Areas for improvement:

- Although maintenance expenditures were higher than any previous year, fundamental deficiencies were discovered in multiple maintenance programs adversely impacting life safety systems. LBNL filed a Noncompliance Tracking System 'recurring issue' report describing failures and/or inadequacies in six maintenance programs.
- Issuing an Energy Savings Performance Contract (ESPC) is LBNL's primary strategy for meeting the 30% energy intensity reduction goal by 2015 and other energy/water/transportation goals required by DOE O 430.2b. Energy intensity increased by over 2% in FY08 and the schedule for awarding this ESPC continues to slip.

### **7.1 Manage Facilities and Infrastructure in an Efficient and Effective Manner that Optimizes Usage and Minimizes Life Cycle Costs**

The rating for Objective 7.1 is **2.3**, which is based on the performance against four measures; A) Maintenance Management, B) Energy and Utilities Management, C) Transformational Energy Action Management and D) Real Property and Space Management.

A) The **Maintenance Management** measure was evaluated based upon meeting the Maintenance Investment Index (MII) & Deferred Maintenance goals for FY 2008, completion of a FY09 Maintenance Plan, and completion of maintenance related reports.

LBNL reported an expenditure of \$4.349M on Deferred Maintenance in FY08 exceeding the goal of \$4.04M. Of the \$4.349M, \$1.35M was spent on the conceptual design of the Seismic Phase 2 Project, which will eliminate numerous deferred maintenance requirements in Building 74. LBNL reported maintenance expenditures of 2.14% (\$14.028M) of the Replacement Plant Value (RPV), thereby exceeding the MII goal of 2%.

Although maintenance expenditures were higher than in previous years, several reports, either in response to incidents, or DOE assessments have identified inadequate maintenance of equipment and systems including those critical to life safety. The maintenance findings of these reports are summarized below.

1. LBNL Investigation Report for the January 9, 2008 Power Outage (March 11, 2008) identified root causes including:
  - "Preventative maintenance on the Transformer Control Building switchgear was inadequate."





- “Reduced inspection frequency for the Transformer Control Building switchgear beginning in 2006.”
- “The corridor heater was not operating.”

Additionally, “the results of Extent of Condition Review found that insufficient staffing levels for the preventative maintenance of the emergency lighting equipment was the primary cause for the Emergency Lighting System Failures.” The recommended corrective actions contained in this report have been implemented.

2. LBNL Fire Protection Program Assessment Corrective Action Plan (August 22, 2008) responded to the findings resulting from a BSO assessment of February 26-28, 2008. Finding #7 states “. . .the contractor has not established comprehensive fire protection procedures regarding the operability, inspection, maintenance, and testing of fire protection systems and features.” LBNL’s causal analysis concluded, “. . . the Facilities Division, responsible for inspection, testing, and maintenance plan (ITMP) execution, made the decision to defer ITMP elements. Documented ITMP criteria and procedures need improvement.” The LBNL Corrective Action Tracking System (CATS) Corrective Action No. 5862-1 lists a due date of 31 December 2008 to “Establish the criteria and publish procedures, including schedules, for the ITMP following applicable NFPA standards”.

The FY09 Maintenance Management Plan was submitted late and as of early December 2008 has not been finalized. The performance expectation required coordination with the BSO, a description of how LBNL will be addressing deferred maintenance over the next 5 years, and validation of current DM totals. BSO personnel discovered in October 2008 after reviewing the draft FY09 Maintenance Management Plan and subsequent discussion with LBNL personnel that deferred maintenance reporting had changed with no coordination with BSO or HQs. All indications are that the LBNL reported only High Priority Deferred Maintenance in FY 2008 rather than reporting all Deferred Maintenance as required by SC-HQs. It appears only \$1,581,833 of the \$4,051,959 newly identified Deferred Maintenance was reported to SC-HQs. In light of an apparent under reporting of DM, the FY08 LBNL DM of \$49,565,114 reported in FIMS may be understated by \$2,470,126. Other required maintenance related reports have been provided in a timely fashion.

**B) Energy and Utilities Management** measure was evaluated based on meeting the 10 required tasks listed in the FY 2008 LBNL Comprehensive Energy Management Plan (CEMP). Seven of the 10 required tasks have been completed. The completed tasks include, procurement of Renewable Energy Credits, meeting sustainability requirements for new buildings and major renovations, installation of Advanced Meters, completion of energy and water audits, reducing petroleum-based fuel usage, and reporting energy consumption data.

The other three required tasks were evaluated as incomplete. The first of the three tasks required LBNL to reduce energy intensity 9% by the end of FY08 (from a FY03 baseline). 2<sup>nd</sup> and 3<sup>rd</sup> quarter progress reports projected this 9% goal would be met. After the final energy consumption data for FY08 had been collected, LBNL reported on 28 October 2008 that energy intensity had increased (digressed) from a 9.45% energy reduction savings at the beginning of FY08 to a 7.17% energy reduction savings at the end of FY08 or an energy intensity increase of over 2%.

The second of these three tasks required LBNL to coordinate and facilitate ESPC DES activities with NORESO to allow them to submit their Delivery Order (DO) proposal to DOE per the BSO/LBNL approved project schedule. The Initial Proposal was approved by DOE HQ in Dec 2007, with the DES to be submitted by April 2008 and DO awarded in June 2008. NORESO under LBNL’s management has failed to meet their scheduled dates and has submitted several schedule revisions. The latest BSO/LBNL approved project schedule of 27 August 2008 has not been met: Draft DES write-ups of ECM’s completed by 9/30/08, with DES draft to LBNL/BSO by 10/20/08. After several requests, a new NORESO schedule was released on 11/17/08 showing a 100% DES submittal to DOE in January 29, 2009.

The third task evaluated as incomplete required the issuance of a draft Executable Water Reduction Program and Plan, which meets DOE requirements. The plan was developed but it did not meet the DOE water reduction requirements because the plan depended on water reduction usage exemptions for certain buildings.



Water use exemptions are currently not allowed by DOE. Additionally, the 2% water reduction goal for FY08 relative to FY07 was not met.

C) The **Transformational Energy Action Management** (TEAM) measure required an update of LBNL's ten year site plan to adequately address LBNL's contribution to meeting the Agency wide goals of the TEAM Initiative and Executive Order 13423. LBNL TEAM and Executive Order 13423 initiatives have been incorporated in the ten year site plan/Annual Laboratory Plan.

D) **The Real Property and Space Management** measure consisted of six tasks, four of which were evaluated to be complete. Completed tasks include documenting underutilized or unsuitable excess space, maintaining Space Banking data, and conducting an internal validation of FIMS data.

The two tasks not fully completed were: 1) FIMS population, and 2) timely acquisition of lease space. Regarding the first task, although LBNL's internal validation of FIMS data found no errors, leased spaces were not included in this year's validation. It was later discovered that the value of tenant improvements to leasehold properties were not adequately recorded in FIMS. Regarding the second task, LBNL did not take action to effect a timely extension of its leased space in Washington DC.

## **7.2 Provide Planning for and Acquire the Facilities and Infrastructure Required to support Future Laboratory Programs**

The rating for Objective 7.2 is **3.4** based on the performance against two measures, A) Integrated Site Planning and B) Construction/Project Management.

A) **Integrated Site Planning** performance measure was evaluated in three areas: completion of the 2007 Ten Year Site Plan (TYSP), NEPA/CEQA compliance and completion of seismic evaluations for all trailers and unoccupied buildings on site.

The TYSP was created in Section 7 of the LBNL's 2008 Annual Laboratory Plan. The Annual Laboratory Plan was professionally prepared, addressing all of the LBNL strategic goals, SC's guidance and BSO's comments.

NEPA/CEQA compliance was achieved for research proposals and construction projects. For the Seismic Phase 2 Project, determinations were made to do a NEPA Environmental Assessment and a CEQA Environmental Impact Report.

ASCE-31 seismic evaluations for 100% of trailer and unoccupied building inventory were reported to be complete as of September 5, 2008.

B) **Construction/Project Management** performance measure was evaluated based on adherence to scope, schedule and cost baselines for the B51/Bevatron Demolition, B77 Rehabilitation Phase 2 (B77Ph2), ALS User Support Building (USB), Seismic Phase 1, Seismic Phase 2 and General Plant Projects.

After a one-year suspension while waiting for project funding, the B51 & Bevatron Demolition Project restarted at the beginning of FY08. LBNL formed an excellent project team which successfully prepared for and received CD-2/3 approval in July 2008. As a result of an excellent bid package and aggressively pursuing potential bidders, a demolition contract was awarded to Clauss Construction at \$15M below the government estimate. Implementation of ISM is consistent throughout all elements of the project. Clauss Construction's Plan of Day meetings are exemplary.

The B77Ph2 project was replanned in two phases and is being managed to cost. The first phase, installing the Utility Center and associated work, was awarded and substantially completed within the performance period, with only punch list items remaining. The project consistently performed within established baselines throughout the period. The second phase, interior work, will commence in FY2009 with project completion in FY2010.



The USB project responded well to a congressionally directed funding change following the FY 2008 CR. The reduction in FY2008 funding resulted in a delay in project completion and increased project cost (mainly due to escalation), and required replanning of the project. The project was subsequently placed on the Watch List until the associated Baseline Change was approved. The project had a favorable Lehman review in March 2008. The project has performed within baselines since that time.

LBNL's Seismic Phase 1 project completed the Independent Project Review (IPR) in February 2008 and achieved CD-2 approval in March 2008. The project is on schedule and within scope and budget.

LBNL's Seismic Phase II project achieved CD-1 approval as scheduled in September 2008. LBNL demonstrated excellent project management in achieving this milestone and several of their work products have been used as examples for other projects throughout the Complex.

General Plant Projects and Institutional General Plant Projects (IGPP) are generally on schedule and within LBNL cost projections; status of GPP projects over \$500k are reported monthly. An IGPP proposal for alteration of B76 did not receive BSO approval prior to the start of work. LBNL appears to have implemented procedures to prevent a reoccurrence. The Facilities Division responded to a LBNL Internal Audit Services Department, Small Construction Projects Audit Report issued November 2007, by producing a new process for Small Projects' Management. The document has been issued but nine of the 13 chapters are still in development. For these chapters, LBNL project managers are referred to the LBNL Design & Construction Manual for current practices.

ELEMENT	Letter Grade	Numerical Score	Objective Weight	Total Points	Total Points
<b>7.0 Sustain Excellence in Operating, Maintaining, and Renewing the Facility and Infrastructure Portfolio to Meet Laboratory Needs</b>					
7.1 Manage Facilities and Infrastructure in an Efficient and Effective Manner that Optimizes Usage and Minimizes Life Cycle Costs	C+	2.3	50%	1.15	
7.2 Provide Planning for and Acquire the Facilities and Infrastructure Required to support Future Laboratory Programs	B+	3.4	50%	1.70	
<b>Performance Goal 7.0 Total</b>					<b>2.9</b>

**Table 7.1 – 7.0 Goal Performance Rating Development**

Total Score	4.3-4.1	4.0-3.8	3.7-3.5	3.4-3.1	3.0-2.8	2.7-2.5	2.4-2.1	2.0-1.8	1.7-1.1	1.0-0.8	0.7-0
Final Grade	A+	A	A-	B+	B	B-	C+	C	C-	D	F

**Table 7.2 – 7.0 Goal Final Letter Grade**



## **8.0 Sustain and Enhance the Effectiveness of Integrated Safeguards and Security Management (ISSM) and Emergency Management Systems**

The Contractor sustains and enhances the effectiveness of integrated safeguards and security and emergency management through a strong and well deployed system.

The weight of this Goal is 8 percent.

The Sustain and Enhance the Effectiveness of Integrated Safeguards and Security Management (ISSM) and Emergency Management Systems Goal measured the Contractor's overall success in safeguarding and securing Laboratory assets that supports the mission(s) of the Laboratory in an efficient and effective manner and provides an effective emergency management program.

For Goal 8.0, Lawrence Berkeley National Laboratory (LBNL) achieved a numerical score of **3.4**, the equivalent of a letter grade of **B+**. Goal 8.0 has four objectives.

### **8.1 Provide an Efficient and Effective Emergency Management System**

For FY2008, performance objective 8.1, LBNL achieved a numerical score of **3.4**, the equivalent of a grade of **B+**. While performance against the measures would have suggested a higher grade should be given, the BSO had to consider the overall impact of performance in relation to the PEMP requirement that "A+" grades have: "Areas of notable performance have or have the potential to significantly improve the overall mission of the Laboratory. No specific deficiency noted within the purview of the overall Objective being evaluated." In the past, LBNL has been implementing emergency management through NFPA 1600 which is not equivalent to the DOE O 151.1C. The primary finding in the FY07 assessment was that LBNL has not conducted a hazard survey and screening per the DOE requirement. In response, LBNL developed and began implementation of a corrective action plan and these activities have been incorporated into the FY08 PEMP. LBNL met expectations within the specific performance measures of the objective; however, there is significant concern on the part of BSO that LBNL will be able to fully implement DOE O 151.1C by the end of FY09 to rate the emergency management system as only meeting expectations.

**The Contractor will demonstrate Emergency Management commitment through developing a long-term Emergency Operations Center (EOC) improvement plan for the improvement of emergency operations.**

In FY08, LBNL developed and implemented a long term improvement plan with the first phase of the plan completed in FY08 and the second phase of the plan to be completed in FY09. The first phase of the plan included the installation of new electrical and data lines, new phone instruments, a security access system to the EOC and the installation of WebEOC software which would allow for a virtual EOC.

**The Contractor will demonstrate Emergency Management commitment through making short-term EOC functional improvements.**

Short term improvements included repair to the satellite phone system that links the LBNL EOC with DOE Headquarters. Further short-term improvements included the installation of 3N software program which is the primary emergency notification system for the EOC.

**The Contractor will demonstrate compliance with DOE O 151.1C in a graded approach by conducting a hazards survey and developing an implementation plan, if necessary.**

LBNL completed the hazards survey in accordance to DOE O 151.1C by May 30, 2008. The subsequent implementation plan was completed on September 30, 2008.

#### Opportunity For Improvement

To ensure full implementation of DOE O 151.1C by the end of FY09, LBNL management must demonstrate commitment to the emergency management effort by applying more resources to the Emergency Management



program. LBNL should survey similar DOE research laboratories to determine appropriate staffing and resource commitment in order to ensure that LBNL will have an adequate and compliant emergency management base program.

## **8.2 Provide an Efficient and Effective System for Cyber-Security**

The Laboratory's score for FY2008 under this performance objective is **3.4**, the equivalent of a letter grade of **B+**.

LBNL's Cyber Security has continued to perform well by exceeding the targeted score of 85 points. On the IT Scorecard, LBNL had an overall score of 99 points. This was reflected by the following examples:

LBNL have exceeded the target of corrective action management by ensuring no overdue POA&Ms for FY08. The POA&Ms were reported on a quarterly basis. LBNL was subjected to several audits during FY08 in which there were no major findings towards cyber. The corrective actions performed were FMS User Access Controls, timeout documentation consistency, guest banner access, and network timeout documentation consistency.

At LBNL, Risk Assessment is an ongoing process where Cyber is constantly evaluating the risk environment. During a FY08 Risk Assessment, out of 47 threats/vulnerability pairs; 44 were found to be at a low level, 3 were found to be a medium level, and there were none at a high level. This performance puts LBNL at an acceptable risk level.

LBNL has exceeded the target to train employees in Cyber Security and PII training during FY08. This training has increased Lab employees' awareness in these areas therefore improving security of PII and sensitive information, stolen credentials, and phishing attacks. Both courses are conducted online.

The BRO Intrusion Detection system has been excellent this year at monitoring network traffic and suspicious activities. BRO has enabled the Lab's network to remain protected from intruders.

## **8.3 Provide an Efficient and Effective System for the Protection of Special Nuclear Materials, Classified Matter, and Property**

The Laboratory's score for FY2008 under this performance objective is **3.4**, the equivalent of a letter grade of **B+**.

While performance against the specific measure would have suggested a higher grade should be given, the BSO had to consider the overall impact of performance. The specific target called for LBNL to conduct a peer review of the LBNL MC&A plan by 05/31/08. The peer review was performed during February 2008 and no findings were identified and no CAP was required. However, during the BSO DOE STD 1027 Hazard Categorization Review conducted in April 2008 many issues were identified with regard to institutional software quality assurance (SQA) and inventory controls. While these findings are not specific to this measure, BSO feels that these performance issues regarding nuclear material are significant relevant to this objective.

## **8.4 Provide an Efficient and Effective System for the Protection of Classified and Sensitive Information**

The Laboratory's score for FY2008 under this performance objective is **3.3**, the equivalent of a letter grade of **B+**.

The protocol required for this objective was finalized on March 26, 2008, and posted on the Berkeley Lab Security Web site on March 29, 2008. This protocol was effectively used in response to recently discovered legacy documents; the documents were recovered and efficiently transported to a secure location for review by Authorized Derivative Classifiers (ADCs). This performance met DOE's performance expectations of the laboratory.



ELEMENT	Letter Grade	Numerical Score	Objective Weight	Total Points	Total Points
<b>8.0 Sustain and Enhance the Effectiveness of Integrated Safeguards and Security Management (ISSM)</b>					
8.1 Provide an Efficient and Effective Emergency Management System	B+	3.4	20%	0.68	
8.2 Provide an Efficient and Effective System for Cyber-Security	B+	3.4	65%	2.21	
8.3 Provide an Efficient and Effective System for the Protection of Special Nuclear Materials, Classified Matter, and Property	B+	3.4	10%	0.34	
8.4 Provide an Efficient and Effective System for the Protection of Classified and Sensitive Information	B+	3.3	5%	0.17	
<b>Performance Goal 8.0 Total</b>					<b>3.4</b>

**Table 8.1 – 8.0 Goal Performance Rating Development**

<b>Total Score</b>	<b>4.3-4.1</b>	<b>4.0-3.8</b>	<b>3.7-3.5</b>	<b>3.4-3.1</b>	<b>3.0-2.8</b>	<b>2.7-2.5</b>	<b>2.4-2.1</b>	<b>2.0-1.8</b>	<b>1.7-1.1</b>	<b>1.0-0.8</b>	<b>0.7-0</b>
Final Grade	A+	A	A-	B+	B	B-	C+	C	C-	D	F

**Table 8.2 – 8.0 Goal Final Letter Grade**



**APPENDIX A**  
**OFFICE OF SCIENCE**  
**FY 2008**  
**SCIENCE AND TECHNOLOGY EVALUATION**  
**OF**  
**LAWRENCE BERKELEY NATIONAL LABORATORY**

<b>Program Area</b>	<b>Page</b>
<b>Advanced Scientific Computing Research (ASCR)</b>	<b>A-2</b>
<b>Biological and Environmental Research (BER)</b>	<b>A-10</b>
<b>Basic Energy Sciences (BES)</b>	<b>A-18</b>
<b>Fusion Energy Sciences (FES)</b>	<b>A-24</b>
<b>High Energy Physics (HEP)</b>	<b>A-27</b>
<b>Nuclear Physics (NP)</b>	<b>A-32</b>
<b>Workforce Development for Teachers and Scientists (WDTS)</b>	<b>A-37</b>



**Office of  
Science**

## **Laboratory Year-End Performance Assessment Report**

Date:  
11/5/2008

Headquarters Program Office Fiscal Year 2008 Evaluation of University of California for  
Management and Operation of the Lawrence Berkeley National Laboratory

Agency:  
U.S. Dept of Energy

Program Office:  
Office of Advanced Scientific Computing Research  
FY Funding Level: (Budget Authority)

Evaluator:

E-mail Address:

### **Goal 1.0 Provide for Efficient and Effective Mission Accomplishment**

Goal Score: 3.53

Goal Grade: A-

Please complete the Objective fields then click the Calculate button to get the final Score and Grade.

#### **Goal 1.0 Performance Summary Statement:**

LBNL research continues to have a broad impact, producing numerous publications, posters, invited talks, and open source software packages. Many years of excellent work have raised ASCR expectation for LBNL research to a very high standard. However, a few standout results have exceeded even these very high expectations in FY08.

#### **Objective 1.1 Science and Technology Results Provide Meaningful Impact on the Field**

Score: 3.6

Grade: A-

Weighting: 40





### **Objective 1,1 Performance Summary Statement:**

In FY08 LBNL continues to have a broad and significant impact in Applied Math, Computer Science and Computational Science.

- LRNL made several significant contributions in support of the efforts of the Intergovernmental Panel on Climate Change (TPCC), which was named a co-recipient of the 2007 Nobel Peace Prize for its work in "disseminating greater knowledge about man-made climate change." The OLCF and NERSC provided more than half of the simulation data for the joint DOE/National Science Foundation (NSF) data contribution to the United Nations Intergovernmental Panel on Climate Change (IPCC) Fourth Assessment Report. In addition, the Earth System Grid (ESG), a coalition of research centers (ANL, LANL, LBNL, LLNL, ORNL, NCAR, NOAAJPMEL, and USC) maximize accessibility of climate simulation data by the international research community.
- An indexing technology developed by LBNL researchers, FastBit, which allows users to search massive datasets up to 40 times faster was recognized with a 2008 R&D 100 award.
- An LBNL group won the Best Poster Award at IEEE VAST 2007 for their poster "Sunfall: A Collaborative Visual Analytics System for Astrophysics," describing the first visual analytics system in production use at a major astrophysics project (the Nearby Supernova Factory).
- A team of LBNL researchers developed the Linear Scaling Three Dimensional Fragment (LS3DF). LS3DF offers a more efficient method for calculating energy potential because it is based on the observation that the total energy of a large (10,000 or more) nanostructure system can be broken down into two component parts: electrostatic energy and quantum mechanic energy. The developers of LS3DF are finalists in the Association for Computing Machinery's (ACM) Gordon Bell Prize Competition for SC08.
- NERSC installed SSH daemons capable of monitoring keystrokes of incoming traffic. The SSH daemon will provide monitoring information to Bro, LBNL's intrusion detection system which automatically blocks suspicious traffic and notifies security personnel.
- A research paper by LBNL researchers exploring ways to make a popular scientific analysis code run smoothly on different types of multi core computers won the Best Paper Award in the application track at the IEEE International Parallel and Distributed Processing Symposium (IPDPS) in April.
- The Berkeley Unified Parallel C (UPC) team - a collaboration of LBNL and UC Berkeley released Berkeley UPC 2.6.0. CDs of the release were distributed at the PGAS (Partitioned Global Address Space) booth at the SC07 conference. UPC is an extension of the C programming language designed for high performance computing on large-scale parallel machines. The language provides a uniform programming model for both shared and distributed memory hardware. The UPC 2.6.0 release contains numerous improvements and fixes. Bundled with this release is the new 1.10.0 release of the GASNet communication system.
- Work by five Berkeley Lab researchers won the best paper award for the applications track at the annual IEEE International Parallel and Distributed Processing Symposium (IPDPS). Carter, Olikar and Shalf also authored a paper that won the same best paper award at the 2007 symposium.
- A report authored by LBNL's Schrier, Demchenko, Wang and Alivisatos was on the list of the most accessed papers published by Nano Letters in the third quarter of 2008. Their paper, "Optical Properties of ZnO/ZnS and ZnO/ZnTe Heterostructures for Photovoltaic Applications," ranked No. 10.
- Three LBNL researchers won the Best Poster prize at the SC07 for their poster describing "A New O(N) Method for Petascale Nanoscience Simulations," which describes a new linear scaling three-dimensional fragment (LS3DF) method for ab initio electronic structure calculations.
- Researchers from Berkeley Lab's Computing Sciences made a significant contribution to SC07. In addition to organizing or co-hosting two workshops and two birds-of-a-feather sessions, LBNL staff are authors on five of the 54 papers to be presented at SC07.



## **Objective 1.2 Provide Quality Leadership in Science and Technology**

Score: 3.5

Grade: A-

Weighting: 30

### **Objective 1.2 Performance Summary Statement:**

LBNL has, in FY08 buttressed its status as an international powerhouse in computer science and applied mathematics and advanced networking. LBNL visionary leadership in areas of this research directly related to high performance computing was international and nationally recognized in FY08.

- A report co-authored by Kathy Yelick and John Shalf at NERSC was among the top issues and trends singled out by the editor of HPCwire for its last issue in 2007. Editor Michael Feldman wrote: "The Landscape of Parallel Computing Research: The View from Berkeley became a wake-up call to the computing community about the perils and pitfalls of our manycore destiny. Was anyone listening? Maybe. In the past year, both Intel and Microsoft spent a gazillion dollars for parallel computing R&D and education. Universities like Purdue, LSU, the University of Manchester, MIT and many others are expanding their HPC curriculums for the next crop of students. By the time these kids start to graduate in 2010, the manycore chips will be spilling out of the fabs."
- On March 18, Microsoft Corp. and Intel Corp. announced the creation of two Universal Parallel Computing Research Centers (UPCRC), the first at UC Berkeley Joint with LBNL) and another at the University of Illinois at Urbana-Champaign. This is considered the first joint industry and university research alliance of this magnitude in the United States focused on mainstream parallel computing.
- LBNL's Meza was named recipient of a two prestigious award: the Blackwell-Tapia Prize and the SACNAS Distinguished Scientist Award.
- LBNL's Paxson was awarded the Association for Computing Machinery's Grace Murray Hopper Award for his work in measuring and characterizing the Internet.
- LBNL's Sethian, was elected to the National Academy of Engineering. A researcher at LBNL since 1982, Sethian was honored "for the development of efficient methods of tracking moving interfaces" Sethian's research has led to the development of "level set methods" - numerical techniques that can follow the evolution of interfaces, as well as a host of other techniques to track interfaces in various settings. The techniques have a wide range of applications, including problems in fluid mechanics, combustion, manufacturing of computer chips, computer animation, image processing, robotic navigation, the structure of snowflakes, and the shape of soap bubbles. In addition to his own research, Sethian has helped educate more than 40 graduate students who have been members of the Mathematics Group.
- LBNL announced a project to design and, in partnership with Tensilica, create a prototype specialized energy-efficient climate supercomputer using microprocessors, such as those used in cell phones and other consumer electronics, to enable "Ultra-High Resolution Models of Climate and Weather". The researchers conclude this "climate computer" would consume less than 4 megawatts of power and achieve a peak performance of 200 petaflops. The project was described in a paper published in the May issue of the International Journal of High Performance Computing Applications and the work was also highlighted in the August issue of IEEE Spectrum.



- At the 25th anniversary celebration of NASA Advanced Supercomputing (NAS) Division at Moffett Field, Calif., LBNL's Bailey was named one of 25 "NAS Superstars."

### **Objective 1.3 Provide and Sustain Outputs that Advance Program Objectives and Goals**

Score: 3.5                      Grade: A-                      Weighting: 15

#### **Objective 1.3 Performance Summary Statement:**

LBNL work in all of the ASCR core research areas provide sustained efforts and world leading groups that are important to the continued success of our program.

The quality and quantity of projects and researchers and pace of progress in FY08 exceeded ASCR's very high expectations for LBNL.

- There was an especially large number of highly cited and best papers awards in FY08 (see above).
- Publication rates at LBNL were significantly higher than at our other top performing labs:
  - According to Web of Science, three senior Applied Mathematics Researchers published 18 articles in peer-reviewed journals such as Proceedings of the National Academies Of Science and Journal of Computing Physics. The topics included algorithm development for combustion and flames, low Mach number modeling of Type Ia supernovae, and stochastic partial differential equations .
  - Also according to Web of Science, four senior Computer Science Researchers published 16 articles in peer-reviewed journals such as ACM Transactions on Mathematical Software, SIAM Journal on Scientific Computing, and IEEE Transactions on Visualization and Computer Graphics. Topics include state-of-the art eigensolvers, parallel languages and compilers, and scientific application performance on supercomputers.

### **Objective 1.4 Provide for Effective Delivery of Products**

Score: 3.4                      Grade: B+                      Weighting: 15

#### **Objective 1.4 Performance Summary Statement:**

The quantity and quality of the LBNL program in ASCR core research is especially strong in key areas both in terms of publications and continued progress but this is in accord with our very high expectations for LBNL.

LBNL Researchers produced numerous significant publications in scientific journals and workshop proceedings in FY08. LBNL Software is made available via open source in a timely manner with documentation and support.

### **Goal 2.0 Provide for Efficient and Effective Design, Fabrication, Construction and Operation of Research Facilities**

Goal Score: 3.57

Goal Grade: A-

#### **Goal 2.0 Performance Summary Statement:**



Years of excellent work have raised ASCR expectations for LBNL facilities to a very high standard of planning, delivery and user support. However, especially good external reviews and new experiences have resulted in LBNL exceeding these very high expectations in FY08.

The National Energy Research Scientific Computing (NERSC) Facility at LBNL is a critical facility for ASCR. As the keystone production supercomputer center for the Office of Science (SC), it offers exemplary, "gold standard" (according to the Lehman review team) computing and data storage resources to the SC community, while successfully upgrading its resources to meet ever-growing SC Programs' needs. NERSC supports 3100 users and 400 projects. NERSC advances ASCR's plans for the Leadership Computing Facilities (LCF) by nurturing computational and application scientists to scale their work that will take advantage of the LCF's capability computing.

LBNL's ESnet, widely regarded as the best facility of its type in the world, plays a critical role in supporting data transaction needs of the SC community and its research collaborators in the United States and in the world in the era of peta-scale data. To name just one example, ESnet is critical in support of the start up of the international Large Hadron Collider (LHC) collaboration. ESnet ensures that LHC's peta-bytes of data can be transacted to desired member facilities securely and in a timely manner for data analysis that might make unprecedented scientific discoveries.

**Objective 2.1 Provide Effective Facility Design(s) as Required to Support Laboratory Programs (i.e., activities leading up to CD-2)**

Score: 3.7 Grade: A-

Weighting: 10

**Objective 2.1 Performance Summary Statement:**

LBNL started planning activities for the NERSC-6 Project (NERSC-6) in 1Q FY2008. NERSC-6 will be a complete, integrated computing system for a multi-user, multi-application parallel scientific workload. LBNL successfully completed CD-O (mission needs statement), and had a very successful Lehman Review. LBNL released a Request for Proposal for NERSC-6 (equivalent to CD-I) ahead of schedule. All of the work for NERSC-6 has been conducted while maintaining the NERSC facility with the new NERSC-5, which was accepted in 1Q FY2008.

**Objective 2.2 Provide for the Effective and Efficient Construction of Facilities and/or Fabrication of Components (execution phase, Post CD-2 to CD-4)**

Score: 3.4 Grade: B+

Weighting: 10

**Objective 2.2 Performance Summary Statement:**

The Cray XT-based NERSC-5, nicknamed Franklin, was accepted in 1Q FY2008. NERSC-5 was immediately utilized by the users to its full capacity. However, demand for more computing time by the SC Programs continues to grow rapidly, and NERSC analyzed several options for upgrades. A NERSC5 quad-core upgrade was selected as the best alternative. NERSC-5 quad-core upgrade has now been completed, and is now in the final configuration phase. The upgrade will double the original NERSC-5 dual-core capacity to about 220 million processor hours for Allocation Year 2009. However, we expect no less from NERSC staff who have years of experience delivering high performance computing resources.

**Objective 2.3 Provide Efficient and Effective Operation of Facilities**

Score: 3.6 Grade: A- Weighting: 70

**Objective 2.3 Performance Summary Statement:**



LBNL has managed both ESnet and NERSC very successfully. The 2008 Facilities Operational Assessment summarized their achievements as follows:

#### ESnet

- ESnet's close collaboration with Internet2 is proving of great value to SC both for network capabilities and cost effectiveness
- ESnet is deploying virtual circuits over ESnet, a significant capability that will provide services to the scientific community not previously possible
- ESnet is prepared to support the large data flows associated with LHC startup
- ESnet's strategic planning in anticipating long-term SC networking requirements continues to be a great value

#### NERSC

- NERSC continues to be a gold standard of a scientific High Performance Computing facility
- The new NERSC resources have been very efficiently brought online and made available to users.
- NERSC has implemented a globally shared file system that is of great benefit to its users that involves five systems and four vendors. This system was one of the keys for the user community's rapid utilization of the new resources.

### **Objective 2.4 Utilization of Facilities to Grow and Support Lab's Research Base and External User Community**

Score: 1 \_\_ 4

Grade: B+

Weighting: 10

#### **Objective 2.4 Performance Summary Statement:**

LBNL has done an excellent job in assisting the users and serving the community around NERSC and ESnet such that users are able to gain assistance and form partnerships with other researchers at LBNL and the entire laboratory complex. The role that LBNL plays in assisting users is critical to ASCR strategies, and LBNL staff have garnered impressive feedback from users. However, we expect no less from the NERSC staff who have years of experience working with users.

ESnet conducts requirements workshops with the SC Programs to ensure that ESnet will meet the Programs' requirements. The workshop format is exemplary, and NERSC has started planning similar requirements workshops based on the ESnet format. However, we expect no less from ESnet staff who have years of experience delivering high performance networking resources that meet mission requirements.

### **Goal 3.0 Provide Effective and Efficient Science and Technology Program Management**

Goal Score: 3.01

Goal Grade: B

Please complete the Objective fields then click the Calculate button to get the final Score and Grade.

#### **Goal 3.0 Performance Summary Statement:**



There were a several LBNL shortfalls in FY08 that were noteworthy if not impactful on their overall scientific accomplishments which remain very impressive.

### **Objective 3.1 Provide Effective and Efficient Stewardship of Scientific Capabilities and Program Vision**

Score: 3.3                      Grade: B+                      Weighting: 30

#### **Objective 3.1 Performance Summary Statement:**

Efficiency and Effectiveness of joint planning (e.g., workshops) with outside community;

- LBNL has participated in joint planning with the outside community but has not lead in a manner commensurate with their high stature.

Articulation of scientific vision;

- LBNL staff has articulated facilities vision that it is executing proficiently through both research and facility planning and operations. However, senior management support for this vision is not at all obvious. Also the vision for the research program has not been well articulated.

Development of core competencies, ideas for new facilities and research programs;

- LBNL continues to have a tendency to be very Berkeley centric and somewhat driven by its current strengths and research leaders.

Ability to attract and retain highly qualified staff.

- LBNL continues to attract some of the best researchers from around the world due to its continued reputation for excellence - FY08 standouts were Yelick and Cotter. But LBNL should use this reputation to cultivate new areas of expertise with potential to advance ASCR missions in the long-term.

### **Objective 3.2 Provide Effective and Efficient Science and Technology Project/Program Planning and Management**

Score: 2.8                                      Grade: B                                      Weighting: 40

#### **Objective 3.2 Performance Summary Statement:**

Quality of R&D and/or user facility strategic plans

- Here LBNL is among the very best internationally. NERSC and ESnet performance and the exceptionally high quality of the research at LBNL is the most meaningful metric.

Adequacy in considering technical risks and success in identifying/avoiding technical problems;

- Here there have been several examples in FY08 where LBNL has failed to anticipate organization and technical obstacles that adversely impact delivery of ASCR services that meet program expectations - notably, management of the SciDAC-08 conference.

Effectiveness in leveraging (synergy with) other areas of research; and

- In ASCR space, LBNL is among the very best at integrating the core research areas and rapidly deploying research results in facilities and infrastructure. However, LBNL is very Berkeley centric and is not nearly so effective at unstructured external partnerships.

Demonstration of willingness to make tough decisions (i.e., cut programs with sub-critical mass of expertise, divert resources to more promising areas, etc.).

- Ever rising LBNL overhead rates are the most important metric that LBNL needs to improve in this area.
- In addition, ASCR is not convinced that LBNL senior management will make the tough decisions necessary to assure the future of high performance computing at LBNL. Senior management attention does not seem to be commiserate with ASCR investment in LBNL.



**Objective 3.3 Provide Efficient and Effective Communications and Responsiveness to Customer Needs**

Score: 3.0

Grade: B

Weighting: 30

**Objective 3.3 Performance Summary Statement:**

The quality, accuracy and timeliness of response to customer requests for information;

- In facilities, LBNL is meeting ASCR's very high expectations but this standard has not carried through to the research program (with a few significant exceptions).

The extent to which the Contractor keeps the customer informed of both positive and negative events at the Laboratory so that the customer can deal effectively with both internal and external constituencies; and

- In general, LBNL meets ASCR's very high expectations in this area for Facilities but again this standard does not carry through to the research program. In addition, even though it is not a contract requirement, ASCR is disappointed with regard to communications and demonstrated LBNL senior management support for the UC financed UC Berkeley computing building.

The ease of determining the appropriate contact (who is on-point for what).

- In general, LBNL meets expectations in its clear communication of roles and responsibilities.



*Office of Science*

## **Laboratory Year-End Performance Assessment Report**

Date:  
11/3/2008

Headquarters Program Office Fiscal Year 2008 Evaluation of University of California for  
Management and Operation of the Lawrence Berkeley National Laboratory

Agency:  
u.s. Dept of Energy

Program Office:  
Office of Biological and Environmental Research  
FY Funding Level: (Budget Authority)

Evaluator:  
Phone Number:

E-mail Address:

### **Goal 1.0 Provide for Efficient and Effective Mission Accomplishment**

Goal Score: 3.74

Goal Grade: A-

Please complete the Objective fields then click the Calculate button to get the final Score and Grade.

#### **Goal 1.0 Performance Summary Statement:**

LBNL has a broad range of research across the Biological and Environmental Research (BER) program with a principal focus on the life sciences.

LBNL exhibited exceptional scientific leadership and innovation in its startup of the highly productive Joint BioEnergy Institute in FY 08.

Biological scientists at the Laboratory continue to be highly recognized, international leaders in many fields. As one of the parent laboratories for the DOE Joint Genome Institute and Production Genomics Facility, LBNL enables genome-based scientific progress in the scientific community especially as it





relates to DOE's energy and environmental missions. LBNL scientists are developing new approaches to assess the sustainability of remediation systems deployed at DOE sites and are productive, scientific leaders in climate research.

### **Objective 1.1 Science and Technology Results Provide Meaningful Impact on the Field**

Score: 3.8                      Grade: A                      Weighting: 30

#### **Objective 1,1 Performance Summary Statement:**

Scientific productivity at the Laboratory in the biological sciences continued to be world-class in FY 2008. From ecosystems comprised of single microbial species, to new insights into microbial stress responses, the publication record in first rank journals is excellent.

Genomics:GTL funded researchers were recipients of a 2008 R&D 100 Award for development of the Berkeley Lab PhyloChip - a DNA microarray that quickly, comprehensively, and accurately identifies species within microbial samples from any environmental source, without any culturing required.

The Joint BioEnergy Institute (JBEI) is one of three BER-funded BioEnergy Research Centers (BRCs) initiated at the very end of FY 2007. While FY 2008 was designated as the start-up phase for the BRCs, JBEI made significant progress in its research program, including several noteworthy publications and patent applications. The senior staff members of JBEI have already made several talks about the center's research program to audiences in the U.S., Europe and Asia.

The Joint Genome Institute (JGI), of which the Laboratory is a principal element, generates increasingly larger amounts of DNA sequences of plants, microbes, and microbial communities (more than 125 billion base pairs in FY 2008). These data are providing fundamental genomic information for biological systems that not only meets the needs of the national research community, but also will be critical for meeting BER energy, climate, and environmental goals and missions.

The Genomics: GTL program contains both large program projects and single investigator projects in a wide range of scientific areas that have produced important advances in techniques and biological insights. These have been published in leading journals such as *Nature*, *Science*, and *Cell*, and additionally have been singled out with highlight articles in these journals.

The Laboratory's low-dose radiation biology program published papers in FY 2008 highlighting the positional context of the cell microenvironment and how tissues respond differently to low dose exposures than do cells in culture. These publications have changed the way the research community thinks about radiation research. Long term DOE support has established the critical importance of the microenvironment in cancer and radiation response. Scientists in the low-dose program have received major national and international recognition, including the Inserm International Foreign Scientist of the Year Award (France); the FASEB - Excellence in Science Award; and the American Cancer Society's Medal of Honor.

The LBNL Environmental Remediation Sciences Program (ERSP) is focused on the sustainability of environmental remediation. A holistic systems approach is used to address this problem with a multidisciplinary team which is focused on three key research sites for the DOE-ERSP. The LBNL continues to have recognized world-class leadership in geophysics, isotope analyses, reactive transport modeling and linking Genomics:GTL research with environmental research. An LBNL investigator is the ERSP distinguished scientist. LBNL Phylochip won an R&D 100 award in 2008.



In climate change research, LBNL produced comprehensive, high quality carbon cycle measurements requested and used by > 1 00 researchers, from US, Europe, and Australia. An LBNL scientist worked with investigators in the DOE ARM and SciDAC programs to incorporate more accurate representations of radiative processes into the Community Climate System Model (CCSM).

**Objective 1.2 Provide Quality Leadership in Science and Technology**

Score: 3.8      Grade: A      Weighting: 20

**Objective 1.2 Performance Summary Statement:**

Biological scientists at the Laboratory continued to be international leaders in many fields in FY 2008. They are frequently invited to lead national scientific planning efforts. The Laboratory continues to push forward innovative and ground breaking technical approaches in systems biology, as well as technological advances in electron microscopy, and imaging and structural biology at the Advanced Light Source (ALS) that are recognized around the world.

LBNL retains climate and environmental research staff members who are active associate and/or coeditors of six scientific journals and have participated at national and international meetings as invited keynote speakers on 35 occasions in FY2008.

LBNL staff, as members of Science Steering Group of the North American Carbon Program (NACP), helped initiate and design the continental synthesis products that are the focus of NACP milestones for all NACP-funded researchers, LBNL high- quality carbon data are being used in three of four major continental synthesis products

LBNL successfully organized an international conference for FY2008 and served as session chairs for the Computational Methods in Water Resources conference and other conferences including the American Geophysical Union (AGU) and the Goldschmidt conference.

**Objective 1.3 Provide and Sustain Outputs that Advance Program Objectives and Goals**

Score: 3.8      Grade: A      Weighting: 20

**Objective 1.3 Performance Summary Statement:**

The overall publication rate of the Laboratory in the biological sciences was outstanding in FY 2008. Genomics: GTL funded researchers alone published more than 60 papers in FY 2008, at least 9 (15%) in *Science*, *Nature*, or *Cell*.

The JGI successfully incorporated new sequencing technologies in a transition from older technologies to the newest state-of-the-art sequencing instrumentation. This resulted in a tripling of sequencing results above the goal that had been set for FY 2008, as well as new tools for analysis of complex plant genomes and community metagenomes.

The LBNL program continues to publish in high quality journals such as *Environmental Science & Technology*, *Applied and Environmental Microbiology* and *Geophysics*. They play a major role in field research within the ERSP program at the Rifle, Hanford and ORNL field research sites, and the Idaho National Laboratory site. They also play a key link between ERSP programs and EM-22 programs at the Savannah River Site (SRS) F-Area.



The LBNL climate change research staff published 34 peer-reviewed papers in high impact journals, such as Science, Scientific American, and Proceedings of the National Academy of Science. Scientists gave 40 invited talks in FY2008.

**Objective 1.4 Provide for Effective Delivery of Products**

Score: 3.6      Grade: A-      Weighting: 30

**Objective 1.4 Performance Summary Statement:**

Development of JBEI successfully met goals set for its initial year. The center moved into leased space that was designed to meet the specific needs of the center, accomplishing the entire process in less than a year. At the same time, the several biological research programs were organized, staff recruited, and the component projects initiated in the new space, and major equipment for research and supporting technologies was acquired and put into operation during this short time period. This is an extraordinary accomplishment. JBEI has aggressively pursued invention and intellectual property targets, filing 8 patent applications and 13 invention disclosures; two of these inventions are currently in discussions with 5 companies for licensing agreements. Two significant shortfalls were an excessive uncosted balance for FY08 and the lack of development of an effective integrated laboratory information management system, that has been deferred to early in FY 2009.

The JGI is effectively delivering world-class science, as measured both by GenBank submissions of new sequences and its vigorous Community Sequencing Program. However coordination and prioritization between various sequencing commitments has not always proven effective, especially with respect to communication with external project contacts.

The Laboratory been able to meet and exceed goals in several areas of technological research for biological applications. For example, the new nanostructure-initiator mass spectrometry technology is outstanding and was developed much more rapidly than expected.

LBNL pioneered the successful completion of a chromium immobilization strategy for the Hanford site and in developing new approaches to assess the sustainability of remediation systems deployed at DOE sites.

The LBNL climate research program has been very productive. Scientists have served in leadership roles. An LBNL investigator as a member of the North American Carbon Program (NACP) Steering Committee has been very effective in building collaborations between DOE and other agency programs.

**Goal 2.0 Provide for Efficient and Effective Design, Fabrication, Construction and Operation of Research Facilities**

Goal Score: 3.87

Goal Grade: A

Please complete the Objective fields then click the Calculate button to get the final Score and Grade.

**Goal 2.0 Performance Summary Statement:**



scientific user community with the addition of new technologies and the efficient and successful migration of these new technologies from research and development to production. The JGI provides a robust and improved interface to the scientific user community. The National Academy of Sciences cited the critical leadership role of the JGI in the success of the National Plant Genome Initiative in a report issued in January 2008. LBNL scientists make excellent use of the user resources at LBNL to further develop and expand their research programs. The JGI does need to improve its coordination and prioritization between various sequencing commitments with respect to communication with external project contacts.

**Objective 2.1 Provide Effective Facility Design(s) as Required to Support Laboratory Programs (i.e., activities leading up to CD-2)**

Score: NA Grade: NA

Weighting: 0

**Objective 2.2 Provide for the Effective and Efficient Construction of Facilities and/or Fabrication of Components (execution phase, Post CD-2 to CD-4)**

Score: NA

Grade: NA

Weighting: 0

**Objective 2.3 Provide Efficient and Effective Operation of Facilities**

Score: 3.9 Grade: A Weighting: 90

**Objective 2.3 Performance Summary Statement:**

The JGI continues to increase its sequencing throughput extraordinarily rapidly, with the addition of new technologies and the efficient and successful migration of these new technologies from R&D to production. At the request of the Program Office, JGI has instituted an Informatics Working Group that will seek to streamline informatics programs within JGI, including all of its partner laboratories. However coordination and prioritization between various sequencing commitments has not always proven effective, especially with respect to communication with external project contacts.

**Objective 2.4 Utilization of Facilities to Grow and Support Lab's Research Base and External User Community**

Score: 3.6 Grade: A- Weighting: 10

**Objective 2.4 Performance Summary Statement:**

The JGI provides a large community sequencing program that addresses needs across a range of



biological research disciplines. This program continues to be effective in growing the external user community of the facility. Various Laboratory scientists are taking advantage of the JGI's capacities and science. The National Academy of Sciences cited the critical leadership role of the JGI in the success of the National Plant Genome Initiative in a report issued in January 2008. Progress was made at the JGI in developing an informatics pipeline to track projects. This is in response to community needs and will assist in serving the external community. The relationship of the JGI with the BRCs to optimize resource allocation for their required substantial amounts of sequencing capacity was not fully established during FY 2008. JGI scientists regularly attend scientific conferences and planning meetings with potential users who are assessing their specific genome resource needs.

The four beamlines for biological research supported by BER at the Advanced Light Source produce science that has extended the applications of these technologies in areas of high value to DOE missions. They are used for characterizing biological tissues, individual cells, subcellular structures and molecular components of cells. Several of the beamlines are attracting a growing external user community and are being used for major projects within the Laboratory, including JBEI.

### **Goal 3.0 Provide Effective and Efficient Science and Technology Program Management**

Goal Score: 3.47

Goal Grade: A-

Please complete the Objective fields then click the Calculate button to get the final Score and Grade.

#### **Goal 3.0 Performance Summary Statement:**

The Laboratory's clear vision for the role it can play in biological research, especially in support of DOE mission needs, is exemplified by the development of JBEI in FY 08.

LBNL has done an outstanding job in the management and development of its research programs across the BER portfolio including JBEI, the JGI, the low dose radiation research program, the ERSP activities, and climate. Laboratory management is to be congratulated for the successful initiation of JBEI in particular. The Laboratory is also commended for its broad-based planning for the future of the JGI and is encouraged to continue its inclusive approach to planning and management.

### **Objective 3.1 Provide Effective and Efficient Stewardship of Scientific Capabilities and Program Vision**

Score: 3.9

Grade: A

Weighting: 20

#### **Objective 3.1 Performance Summary Statement:**

The Laboratory has a clear vision for the role it can play in biological research. This includes both DOE mission-relevant science in the energy and environmental areas, and science that makes use of unique Laboratory capabilities to benefit the Nation in many fields that require innovative biological research. The development of JBEI is the most noteworthy example of this in FY 2008. The center was brought together and made fully operational within less than a year from initial funding in September 2007 thanks to the outstanding vision of its leaders and the leaders of the Laboratory.

The JGI has established project management procedures to handle hundreds of projects of varying levels of complexity (single microbes, to plants, to entire microbial communities) in an effective and efficient manner, while providing up-to-date information on project progress to the users.



The low dose program has adopted a vision statement intended to provide mechanistic understanding of low dose response non-linearity that will be sufficiently compelling to guide regulatory efforts.

The Laboratory has attracted key scientists, leaders in areas such as imaging and structural biology, in developing future directions for the laboratory. At the same time, it has retained outstanding scientists in radionuclide imaging instrumentation physicists, despite severe budget reductions in the BER radiochemistry and instrumentation program.

In FY2008 the LBNL program successfully reorganized its core ERSP research and developed a science plan that describes a new vision for the LBNL program centered on the idea of the sustainability of remediation approaches for DOE subsurface contamination. The science plan reviewed very favorably - especially the concept of sustainable remediation. The science plan has been refined by LBNL in response to the comments of the reviewers and ERSP staff, which encouraged an even tighter integration of the research tasks and research teams and simplification of the management structure. The new vision seeks to foster links between ERSP research and EM-22 activities.

LDNL successfully led the development of the new multi-lab program on Abrupt Climate Change. LBNL chaired a workshop to identify research opportunities for biologically enhanced carbon sequestration, an important DOE research focus.

### **Objective 3.2 Provide Effective and Efficient Science and Technology Project/Program Planning and Management**

Score: 3.8 Grade: A

Weighting: 30

#### **Objective 3.2 Performance Summary Statement:**

The Laboratory has an outstanding record in planning for the biological sciences. The divisions with primary responsibility for this area have consistently received high ratings in peer review, and this has been true during FY 2008.

JBEI was reviewed for management plans and for scientific programs during 2008 and the evaluations were highly favorable. It is noteworthy that the center was brought together and made fully operational within the Fiscal Year, a tribute to its management, as a completely new research facility involving more than 100 staff.

JGI held a recent strategic planning workshop to set up long term scientific goals that address BER mission needs and to develop the necessary supporting infrastructure among the JGI member institutions. The workshop acknowledged the need for the JGI to do more than just expand sequencing capacity but to ensure that annotation and other added-value procedures also are improved.

A coordinated low dose program was developed that builds on Laboratory strengths in cell biology, microenvironment, cancer, systems biology, multi-scale imaging and DNA repair. This is also supported by a significant work-for-others portfolio with funding from DOD, NTH, NASA and the private sector. A Laboratory Directed Research and Development (LDRD) program was initiated to bring multi-scale imaging to bear on the inter-cellular organization of tissues responding to low dose ionizing radiation.

The Laboratory conducts a significant number of projects involving human subjects and has this year made a significant change to improve the review process for these proposals. It quickly and effectively established an internal Institutional Review Board (IRB) so that it does not need to rely on the University of California at Berkeley IRB. The new internal IRB is running smoothly.



In FY2008 the LBNL program successfully reorganized its core ERSP research. Several ERSP projects were redirected or dropped to create a more integrated ERSP program focused on understanding key subsurface physical, chemical and biological processes at three important research sites. The LBNL ERSP science plan was successfully peer reviewed in FY2008 with minimal revisions. The LBNL recruited two excellent early career scientists and a mid-career scientist to fill key roles in their new ERSP research program. The LBNL program is leading an effort to collaborate with EM-22 programs at the SRS (F-area).

In climate research, preliminary plans are focused to address DOE priorities in the carbon cycle, climate modeling, and abrupt climate change.

### **Objective 3.3 Provide Efficient and Effective Communications and Responsiveness to Customer Needs**

Score: 3.1                      Grade: B+                      Weighting: 50

#### **Objective 3.3 Performance Summary Statement:**

The biology programs at the Laboratory in general communicate effectively with the BER Program Office. There were regular teleconference and written communications with JBEI as it put in place its research programs in its leased space. The senior management of the center has been highly responsive to requests for information from BER. One serious problem, however, developed during the year in the center and was not communicated to BER. This concerned a large uncashed balance that was not discovered until late in the Fiscal Year. The Laboratory did not provide this information in a timely way, despite the size of the balance and the potential damage to the BER future year budgets it could cause.

The JGI Project Management Office has instituted procedures for project management and tracking of numerous, diverse sequencing projects. The JGI has been responsive when asked for documents.

The newly created integrated low dose radiation program has set milestones for research in adaptive response, chromatin modification and non-target cell response that are monitored by a Laboratory steering committee. Results will be communicated to the Program Office by quarterly written report, by discussions between scientists and BER staff, and via the Life Sciences Division Newsletter.

The LBNL continues to respond to BER requests for information, to effectively help coordinate ERSP program activities (PI meeting, website, etc.), and to keep BER program managers apprised of program activities. The LBNL scientists also contribute to a wide range of EM sponsored workshops and planning activities that advance the implementation of ERSP funded science at DOE sites.





## **Office of Science Laboratory Year-End Performance Assessment Report**

Date: 11/10/2008

Headquarters Program Office Fiscal Year 2008 Evaluation of University of California for Management and Operation of the Lawrence Berkeley National Laboratory

Agency:

U.S. Dept of Energy

Program Office:

Office of Basic Energy Sciences

FY Funding Level: (Budget Authority)

### **Goal 1.0 Provide for Efficient and Effective Mission Accomplishment**

Goal Score: 3.93

Goal Grade: A

#### **Goal 1.0 Performance Summary Statement:**

Materials sciences research programs are world-class and have had broad impact in nanoscience, materials chemistry, complex correlated electron systems, and quantum theory of materials. Chemical sciences (chemical physics, the Chemical Dynamics Beamline at ALS, scalable methods for electronic excitation and optical responses in nanostructures, and combustion chemistry) and geosciences research programs demonstrated outstanding scientific progress and significant impact and effective delivery of S&T results.

#### **Objective 1.1 Science and Technology Results Provide Meaningful Impact on the Field**

Score: 3.9

Grade: A

Weighting: 50

#### **Objective 1.1 Performance Summary Statement:**

The BES Materials Sciences and Engineering (MSE) Division supported Materials Chemistry and Biomolecular Materials program was peer reviewed in FY 2008. The program was seen as performing exciting, and in some cases cutting edge, research in contemporary materials science, especially in surface and interfacial science, nanoscale materials synthesis and their spatial organization, plastic electronics, advanced NMR techniques, and biomolecular materials. However, a major shortcoming noted was the uneven content and quality of some of the review documents submitted by LBNL, which required specific follow-up action items.

The BES programs in Physical and Mechanical Behavior, Electron Microscopy, and Synthesis and Processing at LBNL were not peer reviewed in FY 2008. In the last review, the programs were generally found to be of very high quality. The BES Condensed Matter Physics program at LBNL was reorganized in FY 2007 into coherent projects focused on superconductivity, ultrafast materials science, quantum materials, and magnetism following FY 2006 BES review guidance. For FY 2008, research activities in complex and correlated electron systems, quantum theory of materials, carbon nanotubes were judged as world-class and highly relevant to the mission of the Department

Several programs supported by the BES Chemical Sciences, Geosciences, and Biosciences (CSGB) Division were reviewed in FY 2008. The Atomic, Molecular, and Optical Sciences (AMOS) Program and the Ultrafast X-ray Science Laboratory (UXSL) were reviewed on site in May 2008. The LBNL AMOS program was highly productive and was energized by the hiring of an excellent Divisional Fellow. During the three-year review period, the degree of synergy and focus of this group grew to a remarkable extent. The experimental and theoretical efforts continued to excel and became fully integrated; the program's research goals were highly relevant to the aims of BES. In the initial funding period of the UXSL, LBNL did an exceptional job at assembling excellent personnel and capabilities that have great potential to significantly advance the field of ultrafast x-ray science. However, continued effort in strategic planning is needed to establish focused short-term and long-term goals, and to develop the full potential of





the program.

The Catalysis Science program at LBNL was site reviewed on site in March 2008 and received superlative reviews. This large, diversified program encompasses both homogeneous and heterogeneous catalysis and includes all aspects of synthesis, mechanism and kinetics, instrumentation, and theory and simulation. All of the investigators are nationally and internationally recognized. Reviewer comments such as "World-leading results ...", "Some of the most creative, important and exciting research in the world ....", "Groundbreaking progress ..." indicated the exceptional impact of these projects. It was suggested that increased theoretical interactions would yield even higher impact Science.

The Heavy Element Chemistry program was reviewed simultaneously with the catalysis program. This wide-ranging program received strong reviews in all areas; the team is among only a few groups in the world with the capabilities and experience to perform well in such a broad ranges of scientific topics. The productivity in high-profile journals was outstanding. The addition of a new, senior scientist in the area of gas-phase ion chemistry of f-element species was endorsed in a separate mail review.

All LBNL projects supported under the newly-formed Photo- and Biochemistry Team were jointly reviewed on site in July 2008. These projects represent a considerable breadth of science, ranging from studies on photosynthetic energy capture and transduction, to fundamental research aimed at the development of inorganic photocatalysts for solar fuel production, to using biological systems for the creation of new nanotechnology. Reviewer comment was extremely consistent, with all research activities being praised for excellent quality, high impact, and outstanding productivity. The reviewers regarded the investigators as world-class in their respective areas of study.

LBNL embarked on a reorganization of its Geosciences Programs to increase their focus on unique national laboratory capabilities to provide cutting edge research. It launched a new Nanogeosciences Center that consolidates a number of excellent individual activities. Four smaller projects were renewed for funding through the normal review process, and one was declined.

The LBNL Chemical Physics programs, including the Chemical Dynamics Beamline at the Advanced Light Source (ALS), were not reviewed in FY 2008; these programs continued to be extremely productive and to demonstrate excellent scientific progress.

### **Objective 1.2 Provide Quality Leadership in Science and Technology**

Score: 4.1      Grade: A+      Weighting: 20

#### **Objective 1.2 Performance Summary Statement:**

The research projects supported at LBNL by the BES MSE Division were deemed to be of very high quality, with the activities in surface and interfacial science, complex and correlated electron systems, quantum theory of materials, carbon nanotubes and other nanoscale materials, and advanced NMR technique development recognized as being world-class by the most recent program reviews. The world-leading status of the program was further reflected by the numerous honors and awards garnered by the principal investigators.

In response to the FY 2007 Solar Energy Utilization solicitation, LBNL submitted a proposal for a Solar Energy Research Center (SERC) devoted to generation of chemical fuels from sunlight using abundant materials and scalable manufacturing processes. The overall evaluation by BES was favorable.

The total requested budget for this project was \$56.8M over three years. BES recommended the SERC be funded at \$1M for one year (FY 2007 funds). The FY 2007 funds were used to jump start important preliminary research in key areas and to allow LBNL to revise the scope, thrusts, and organization of the SERC based upon the review comments and available resources. Funding for FY 2008 was increased to \$5M (total) from the MSE and CGBS Divisions in BES. The work plan and ongoing activities in SERC were performed in coordination with BES through a series of regularly scheduled conference calls among appropriate BES program managers, team leads, and division directors and LBNL SERC management. The project is scheduled for an on-site review in May 2009.



Demonstrated by the strong FY 2008 reviews, a large number of investigators in the CSGB-Division supported programs in AMO and ultrafast science, catalysis, heavy element chemistry, photochemistry, biosciences, and geosciences were very highly regarded nationally and internationally. Many shared joint faculty appointments with the University of California at Berkeley and were in high demand at National Academy studies, international conferences, and other high-profile activities. One catalysis researcher was awarded the 2008 Priestly Award from the American Chemical Society. One photochemistry investigator co-chaired the Basic Energy Sciences Advisory Committee (BESAC) subcommittee on "Grand Challenges for Basic Energy Sciences." The resulting report, "Directing Matter and Energy: Five Challenges for Science and the Imagination," was well received by the scientific community. Recent hiring into CSGB Division supported programs continued to demonstrate that world-class scientists are attracted to LBNL.

### **Objective 1.3 Provide and Sustain Outputs that Advance Program Objectives and Goals**

Score: 3.9 Grade: A Weighting: 15

#### **Objective 1.3 Performance Summary Statement:**

The activities supported by the BES MSE Division continued to produce a large number of excellent quality, peer reviewed journal articles with significant impact.

The quantity and quality of BES CSGB Division supported research outputs in peer-reviewed journals, including high-impact journals, were deemed outstanding by peer review in FY 2008

### **Objective 1.4 Provide for Effective Delivery of Products**

Score: 3.8 Grade: A Weighting: 15

#### **Objective 1.4 Performance Summary Statement:**

The activities supported by the MSE Division were effective in transmitting the results to the community. LBNL communicated the research highlights to BES in a timely manner and also published them on their website for wider dissemination.

CSGB Division research programs were effective and efficient in meeting scientific objectives and milestones, as measured by peer review; the programs were responsive to requests from CSGB for information and research highlights.

### **Goal 2.0 Provide for Efficient and Effective Design, Fabrication, Construction and Operation of Research Facilities**

Goal Score: 4.00

Goal Grade: A

#### **Goal 2.0 Performance Summary Statement:**

The Advanced Light Source (ALS) continues to excel in its high-profile scientific output and operational reliability. The facilities are performing as worldwide leaders in their respective fields. The Transmission Electron Aberration-corrected Microscopy (TEAM) MIE project is on schedule and within the cost baseline. Molecular Foundry and the National Center for Electron Microscopy (NCEM) user facilities operated efficiently and effectively with minimal downtime.

### **Objective 2.1 Provide Effective Facility Design(s) as Required to Support Laboratory Programs (i.e., activities leading up to CD-2)**

Score: 4.0

Grade: A

Weighting: 20



**Objective 2.1 Performance Summary Statement:**

The ALS and the laboratory developed a well thought strategic plan for a new light source. They have been interacting aggressively with user community and experts in the field

**Objective 2.2 Provide for the Effective and Efficient Construction of Facilities and/or Fabrication of Components (execution phase, Post CD-2 to CD-4)**

Score: 4.0

Grade: A

Weighting: 15

**Objective 2.2 Performance Summary Statement:**

LBNL retains primary responsibility for TEAM project management, controls, and direction during the execution phase, as well as providing technical leadership on stage design, column integration, and software and detector development. Management of this complex Major Item of Equipment (MIE) project, which involves four other research groups and two commercial vendors, has continued to be very strong, and the project remains on schedule and within the cost baseline. This project was reviewed twice in FY 2008 (in November 2007 and July 2008) to assess its status; each of these reviews yielded useful insights but no major issues threatening project success. FY 2008 progress was excellent, as evidenced by the project's attainment of its CD-4a milestone for TEAM 0.5 in September 2008. Technical work on TEAM 0.5 conducted in FY 2008 has led to the beginning of TEAM-related scientific publications in peer-reviewed literature (the first in October 2008).

The ALS User Support Building (USB) project did an outstanding job of working with its Design-Build subcontractor in order to replan project work, in response to a lower than requested FY 2008 appropriation. The revised plan passed a March 2008 review led by the Office of Project Assessment, and enabled the project's baseline change proposal to be successful, resulting in a rebaselining decision by the Department's Deputy Secretary in June 2008. The project is pursuing a Leadership in Energy and Environmental Design (LEED) silver certification. The project encountered another challenge late in FY 2008 when a contaminated pipe was uncovered on the site, necessitating response actions that LBNL attended to in a timely and professional manner

In mid-FY 2008, the Molecular Foundry project received the 2007 Secretarial Award of Excellence in Project Management, the Department's highest recognition in project management

**Objective 2.3 Provide Efficient and Effective Operation of Facilities**

Score: 4.0

Grade: A

Weighting: 50

**Objective 2.3 Performance Summary Statement:**

The BES Scientific User Facility Division conducted a triennial review of the ALS on March 4-6, 2008. The ALS made significant improvements for its user community including a web-based proposal system, an improved user safety program with a full time Safety Officer, and improved user support. ALS operated for 4721 hours with 91.7% reliability. There were 1939 unique users. ALS maintained a very high level of scientific productivity with a high percentage of high impact publications. It is very effective in engaging its Scientific Advisory Committee and user community in strategic planning.

ALS was used by many research programs at LBNL. The Molecular Foundry staff and users took regular advantage of the ALS.

Both the Molecular Foundry and the National Center for Electron Microscopy (NCEM) user facilities operated efficiently and effectively with minimal downtime. Operating time and capabilities were constrained, primarily by budget limitations and by equipment maintenance and repair needs.

**Objective 2.4 Utilization of Facilities to Grow and Support Lab's Research Base and External User Community**



Score: 4.0                      Grade: A                      Weighting: 15

**Objective 2.4 Performance Summary Statement:**

The Molecular Foundry continued to carry out and facilitate a strong scientific program in FY 2008, with a very substantial increase in the number of users over that in FY 2007 as the facility comes closer to steady-state staffing levels and operating procedures. The Foundry also responded satisfactorily to reviewer and BES recommendations from their initial operations review in FY 2007, with appropriate changes in management structure.

Through leadership of the TEAM project, the NCEM has substantially enhanced the laboratory's programs and visibility. Recent results in presentations and publications indicated increasing strength and high quality in user and staff science. Operations associated with other NCEM capabilities continued strongly as well. A decrease in the number of users in FY 2008 versus FY 2007 was consistent with earlier review recommendations to exercise greater selectivity in approval of user proposals to ensure that the strongest science is adequately accommodated and to improve work environment.

**Goal 3.0 Provide Effective and Efficient Science and Technology Program Management**

Goal Score: 3.49

Goal Grade: A-

**Goal 3.0 Performance Summary Statement:**

The materials sciences research programs are very responsive to the Department's mission in basic science and provide a strong underpinning to mission needs and applications in ceramics, electronic materials, and nanotechnology. LBNL management has improved its performance in providing timely response to BES requests for action and information. Research within the Chemical Sciences Division at LBNL is effective in its use of the scientific capabilities of LBNL. Each project has a well defined scientific objective, most have world-class principal investigators, and synergism among principal investigators has improved. The scientific user facilities are performing as worldwide leaders in their respective fields. LBNL management was successful in establishing the Solar Energy Research Center (SERC) as an integral part of the Helios program.

**Objective 3.1 Provide Effective and Efficient Stewardship of Scientific Capabilities and Program Vision**

Score: 3.7                      Grade: A-                      Weighting: 40

**Objective 3.1 Performance Summary Statement:**

The MSE Division program at LBNL was very responsive to the Department's mission in basic science and provided a strong underpinning to mission needs in energy-related applications. Based on the most recent peer reviews, LBNL was a leader in formulating new applications and research in nanoscale materials with programs in areas such as buckyballs, nanotubes, and nanocrystals, especially exploiting their use in solar energy conversion and catalysis. The highly inter-disciplinary and collaborative projects were also seen as being managed effectively by the LBNL management.

Division research. The Ultrafast X-Ray Science Laboratory, reviewed for the first time in FY 2008, assembled exceptional personnel, including new divisional fellows, and new capabilities to ensure scientific success, but needs to develop a clearer mission and focus.

**Objective 3.2 Provide Effective and Efficient Science and Technology Project/Program Planning and Management**

Score: 3.5

Grade: A-

Weighting: 30

**Objective 3.2 Performance Summary Statement:**

LBNL was fully engaged in BES scientific workshops, especially those that addressed the fundamental energy and



grand science challenges of the future. LBNL developed an effective safety program that includes the recounting of "near miss" accidents. BES applauds this increased emphasis on safety training and awareness, and regards this as a critical priority for the Materials Sciences and Engineering program. LBNL management succeeded in restructuring the Condensed Matter Physics program into coherent projects in FY 2007, and has recently reorganized the Materials Chemistry program to enhance synergies, thus demonstrating forward-looking scientific vision and leadership in program management. The laboratory was taking steps to address the future leadership issue in the Electronic Materials project.

As a result of a lower than requested FY 2008 BES appropriation, LBNL management was successful in structuring the SERC project and delivered to BES a comprehensive work-breakdown structure with corresponding budget and staffing plan. Leadership worked diligently and carefully with BES, taking into account the reviews of the original proposal and demonstrating quality strategic planning.

At a FY 2008 CSGB Division laboratory management review, LBNL management presented a clear description of CSGB Division supported programs, synergies between them, and the context of those programs in the larger strategic vision of LBNL.

### **Objective 3.3 Provide Efficient and Effective Communications and Responsiveness to Customer Needs**

Score: 3.2                      Grade: B+                      Weighting: 30

#### **Objective 3.3 Performance Summary Statement:**

Communications with MSE Division management improved, including providing periodic update on research results and highlights. Further improvement is needed for action and information requests in a timely and requisite manner. Specifically, LBNL management was delinquent in responding to the FY 2007 peer review guidance letter requests by several months. With regard to the Materials Chemistry program review in FY 2008, LBNL provided timely and necessary responses to action items which also included potential funding consequences.

Communications between the CSGB Division and LBNL management in the Chemical Sciences, Earth Sciences, and Physical Biosciences Divisions was thorough and timely in FY 2008. Communications between BES and the LBNL SERC management was effective and complete, allowing BES to stay fully informed of the status of this important project.



## **Office of *Science*** **Laboratory Year-End Performance Assessment Report**

Date: 11/21/2008

Headquarters Program Office Fiscal Year 2008 Evaluation of University of California for Management and Operation of the Lawrence Berkeley National Laboratory

Agency:

U.S. Dept of Energy

Program Office:

Office of Fusion Energy Sciences

FY Funding Level: (IBudget Authority)

\$4.918M

Evaluator:

Phone Number

E-mail Address:

### **Goal 1.0 Provide for Efficient and Effective Mission Accomplishment**

Goal Score: 3.24

Goal Grade: B+

Please complete the Objective fields then click the Calculate button to get the final Score and Grade.

#### **Goal 1.0 Performance Summary Statement:**

As the U.S. facility for Heavy Ion Fusion (HIF)/Warm Dense Matter (WDM) program, significant progress was made in both HIF and WDM.

#### **Objective 1.1 Science and Technology Results Provide Meaningful Impact on the Field**

Score: 3.1

Grade: B+

Weighting: 30

#### **Objective 1.1 Performance Summary Statement:**

The August 13, 2008 Program Advisory Committee on-site peer review and subsequent report stressed the successful stewardship of the HIF/WDM.

#### **Objective 1.2 Provide Quality Leadership in Science and Technology**



Score: 3.4      Grade: B+      Weighting: 20

**Objective 1.2 Performance Summary Statement:**

LBNL collaborated extensively with PPPL and LLNL on the innovative, unique, high risk/payoff, long-term HIF/WDM research program.

**Objective 1.3 Provide and Sustain Outputs that Advance Program Objectives and Goals**

Score: 3.4      Grade: B+      Weighting: 25

**Objective 1.3 Performance Summary Statement:**

The Neutralized Drift Compression Experiment (NDCX) achieved an increase in beam density of 70,000% for HIF.

**Objective 1.4 Provide for Effective Delivery of Products**

Score: 3.1      Grade: B+      Weighting: 25

**Objective 1.4 Performance Summary Statement:**

The first WDM experiments were initiated on the NDCX.

Goal 2.0 Provide for Efficient and Effective Design, Fabrication, Construction and Operation of Research Facilities

Goal Score: 0.00

Goal Grade: NA

Please complete the Objective fields then click the Calculate button to get the final Score and Grade.

**Goal 2.0 Performance Summary Statement:**

Objective 2.1 Provide Effective Facility Design(s) as Required to Support Laboratory Programs (i.e., activities leading up to CD-2)

Score: NA      Grade: NA      Weighting: 0

**Objective 2.1 Performance Summary Statement:**

NA

**Objective 2.2 Provide for the Effective and Efficient Construction of Facilities and/or Fabrication of Components (execution phase, Post CD-2 to CD-4)**

Score: NA      Grade: NA      Weighting: 0

**Objective 2.3 Performance Summary Statement:**

NA

**Objective 2.4 Utilization of Facilities to Grow and Support Lab's Research Base and External User Community**

Score: NA      Grade: NA      Weighting: 0

**Objective 2.4 Performance Summary Statement:**

NA

**Goal 3.0 Provide Effective and Efficient Science and Technology Program Management**

Goal Score: 3.10

Goal Grade: B+

Please complete the Objective fields then click the Calculate button to get the final Score and Grade.

**Goal 3.0 Performance Summary Statement:**





Possible upgrades for the U.S. HIF/WDM facility were clearly defined

**Objective 3.1 Provide Effective and Efficient Stewardship of Scientific Capabilities and Program Vision**

Score: 3.1                      Grade: B+                      Weighting: 35

**Objective 3.1 Performance Summary Statement:**

A 20 Year R&D Plan was presented to the Fusion Energy Science Advisory Committee (FESAC) Panel, which is preparing a peer review of High Energy Density Laboratory Plasmas program that includes HIP *IWDM*. The Plan included a "Path" for HIP.

**Objective 3.2 Provide Effective and Efficient Science and Technology Project/Program Planning and Management**

Score: 3.1                      Grade: B+                      Weighting: 30

**Objective 3.2 Performance Summary Statement:**

The collaboration has demonstrated synergy with other areas of research by investigating the use of Fast Ignition type pulses, National Ignition Facility type Hohlraum targets, and Radio Frequency (RF) Wobblers for beam smoothing.

**Objective 3.3 Provide Efficient and Effective Communications and Responsiveness to Customer Needs**

Score: ~~3~~ . 1                      Grade: B+                      Weighting: 35

**Objective 3.3 Performance Summary Statement:**

The NDCX-II upgrade was clearly defined.





## **Office of Science**

# **Laboratory Year-End Performance Assessment Report**

Date:

11/18/2008

Headquarters Program Office Fiscal Year 2008 Evaluation of University of California for Management and Operation of the Lawrence Berkeley National Laboratory

Agency:

U.S. Dept of Energy

Program Office:

Office of High Energy Physics

FY Funding Level: (I3udget Authority)

Evaluator:

Phone Number:

E-mail Address:

### **Goal 1.0 Provide for Efficient and Effective Mission Accomplishment**

Goal Score: 3.74

Goal Grade: A-

Please complete the Objective fields then click the Calculate button to get the final Score and Grade.

#### **Goal 1.0 Performance Summary Statement:**

LBNL has world leading programs in cosmology, collider physics, detector development, superconducting magnets, and laser driven electron accelerators.

LBNL physicists are national and international leaders in several subfields: I. Hinchliffe in ATLAS physics, K. Einsweiler in Silicon tracking detectors, D. Quarrie in the ATLAS Software Project, and M. Barnett in ATLAS outreach and the PDG.

Staff members have leadership roles in the scientific community: R. Cahn chairs the DPF of the APS and M. Zisman is program manager for the NFMCC.

The Laser-Driven Plasma Wakefield work of Wim Leemans and his L'OASIS group are world leaders in this new technology.



LBNL CCDs (charge coupled devices) are fast becoming the technology of choice for a wide range of optical detectors including SNAP and various ground-based imaging cameras, including the Dark Energy Survey (DES) project and the Sloan Digital Sky Survey III.

LBNL is providing leadership for SDSS-III and the Baryon Oscillation Spectroscopic Survey (BOSS) collaboration.

LBNL is the lead lab in the High-field Quadrupole effort in LARP and is co-hosting the Daya Bay collaboration.

LBNL has been a leader in accelerator design simulations, in particular, electron-cloud effects and their mitigation.

#### **Objective 1.1 Science and Technology Results Provide Meaningful Impact on the Field**

Score: 3.8                      Grade: A                      Weighting: 30

##### **Objective 1.1 Performance Summary Statement:**

The Laser-Driven Plasma Wakefield work of the L'OASIS group continues to be the world leader and innovator in this field.

LBNL provides leadership in the JDEM with several staff members serving on the Science Coordination Group

The CCD design and development work of LBNL is ground breaking and the lab is now providing CCD's for a number of projects, including DES, SDSS III and BOSS.

##### **Objective 1.2 Provide Quality Leadership in Science and Technology**

Score: 3.8                      Grade: A                      Weighting: 30

##### **Objective 1.2 Performance Summary Statement:**

Wim Leemans leads the L'OASIS group which is a world leader in laser-driven plasma wakefield research aimed at developing new accelerators for high energy physics and material's research. Saul Perlmutter and David Slegel lead the SNAP (SuperNova/Acceleration Probe) project which is playing a major role in the NASA/DOE JDEM.

William Edwards is the project manager and Kam-Bui Luk is the co spokesman of the collaboration of the Daya Bay reactor-based neutrino oscillation experiment. LBNL has taken the lead role in coordinating the Daya Bay project with its Chinese colleagues.

Several LBNL physicists (K. Einsweiler, D. Quarie, I. Hinchliffe and M. Barnett) have leadership roles in the international ATLAS project.

M. Barnett heads the PDG which submitted a five year plan in FY08 that was successfully reviewed in September, 2008.

##### **Objective 1.3 Provide and Sustain Outputs that Advance Program Objectives and Goals**

Score: 3.6                      Grade: A-                      Weighting: 30

##### **Objective 1.3 Performance Summary Statement:**

LBNL has maintained world leading programs in cosmology, collider physics, detector development,



superconducting magnets, and laser driven electron accelerators for many years. Recent developments in CCD technology at LBNL have advanced the state of optical detectors ,worldwide.

LBNL attracts and produces excellent students for the field.

The LBNL Theory group is small and did not review as well as the other lab groups in the 2008 DOE comparative review.

**Objective 1.4 Provide for Effective Delivery of Products**

Score: 3.8                      Grade: A                      Weighting: 10

**Objective 1.4 Performance Summary Statement:**

The L'OASIS group, the CCD development group of the microelectronics lab, and the SC magnet group have delivered equipment and technology on time and within budget.

The LBNL US ATLAS group has provided equipment on time and within budget.

The PDG group is progressively falling behind its publication schedules and is facing manpower and computing challenges.

**Goal 2.0 Provide for Efficient and Effective Design, Fabrication, Construction and Operation of Research Facilities**

Goal Score: 3.50

Goal Grade: A-

Please complete the Objective fields then click the Calculate button to get the final Score and Grade.

**Goal 2.0 Performance Summary Statement:**

LBNL is involved in two major design efforts. The first is SNAP, the Supernova Acceleration Probe, which may become a component in the Joint Dark Energy Mission of NASA and DOE. The other is the Daya Bay reactor neutrino experiment to measure  $\sin^2(2\theta_{13})$ . Both efforts are making satisfactory progress.

The major fabrication effort at LBNL has been the ATLAS detector project being built at CERN.

LBNL has met all of their milestones on time and on budget and this project is complete.

**Objective 2.1 Provide Effective Facility Design(s) as Required to Support Laboratory Programs (i.e., activities leading up to CD-2)**

Score: 3.6

Grade: A-

Weighting: 50

**Objective 2.1 Performance Summary Statement:**

The Supernova Acceleration Probe (SNAP), which aims to become a major contributor to the Joint Dark Energy Mission of NASA and DOE, is in the R&D stage. Its technology will compete with at least two other projects, including DESTINY and ADEPT, for inclusion in JDEM. SNAP has been conducting a thorough research and development program to develop new light sensors for the experiment. Both the rad-hard CCDs and the new infrared detectors have reached a state of maturity that they could contribute to the final project. SNAP has put together a management team that may make major contributions to JDEM.

The Daya Bay project has succeeded to work with a less than optimal budget profile in a creative and effective fashion. The LBNL group in the Daya Bay collaboration includes both Kam-Bui Luk, the co spokesman of the collaboration and William Edwards, the project manager.



**Objective 2.2 Provide for the Effective and Efficient Construction of Facilities and/or Fabrication of Components (execution phase, Post CD-2 to CD-4)**

Score: 3.4 Grade: B+ Weighting: 50

**Objective 2.2 Performance Summary Statement:**

The major fabrication effort (post CD-2) at LBNL is the ATLAS project, was completed at CERN. LBNL has met all of their milestones on time and on budget.

A second project which has passed the CD-2/3a and CD-3b stages is the Daya Bay reactor neutrino experiment to measure  $\sin(8_{13})$ . LBNL is actively engaged in the design and evaluation of the frontend electronics.

**Objective 2.3 Provide Efficient and Effective Operation of Facilities**

Score: NA Grade: NA Weighting: NA

**Objective 2.3 Performance Summary Statement:**

Objective 2.4 Utilization of Facilities to Grow and Support Lab's Research Base and External User Community

Score: 0.0 Grade: NA Weighting: a

**Goal 3.0 Provide Effective and Efficient Science and Technology Program Management**

Goal Score: 3.28 Goal Grade: B+

Please complete the Objective fields then click the Calculate button to get the final Score and Grade.

**Goal 3.0 Performance Summary Statement:**

The development of new detector technologies and advancing the state of the art in superconducting magnets has been a core competency of LBNL for many years. This effort has resulted in major contributions to the BaBar, CDF, and ATLAS silicon vertex detectors. The Microsystems Laboratory has been critical to these efforts and is now contributing to the development of CCD detectors for SNAP and the Dark Energy Survey. LBNL has also developed technology for cosmic microwave

background (CMB) measurements and is developing highly integrated detectors to search for the polarization of the CMB, the POLARBEAR project, which was recently funded by the NSF.

The superconducting magnet group has managed to preserve a lean but well integrated group that has expertise on all aspects of superconducting magnet development from conductor development to magnet fabrication and through testing.

Communications of the lab with the OHEP have improved over the last year. This has led to better budget and planning processes. The recent successful PDG review was an important step in the right direction.

**Objective 3.1 Provide Effective and Efficient Stewardship of Scientific Capabilities and Program Vision**

Score: 3.6 Grade: A- Weighting: 40

**Objective 3.1 Performance Summary Statement:**

LBNL has a strong vision in the energy and cosmology frontiers. They provide detector technology to implement their vision. The development of new detector technologies and advancing the state of the art in superconducting magnets, the development of CCD detectors for SNAP, the Dark Energy Survey, SDSS III and BOSS have all been long term efforts at LBNL that are leading to new scientific capabilities that will enable new frontier projects.

**Objective 3.2 Provide Effective and Efficient Science and Technology Project/Program Planning and Management**

Score: 3.1 Grade: B+ Weighting: 40

**Objective 3.2 Performance Summary Statement:**



LBNL management should have a better mastery of its budget which should then be communicated to the OHEP more effectively,

The program at LBNL is complicated with many overlapping efforts in cosmology and accelerator R&D occurring simultaneously. The lab management of these efforts is challenging but there has been improvement on this front over the last year. Somewhat better communications with the OHEP has been noted and the planning process has improved to the point that several potential problems have been avoided. The successful review of the five year plan of the PDG is a case in point. However, the theory effort does not appear to be as well managed as similar efforts at other labs.

The Nearby Supernova Factory Project (SNF) was criticized at the lab's annual review in 2007 for poor management which caused the project to miss its goals. That project is now on track to meet its goals. The project has more than 500 spectroscopically confirmed Supernovae.

The management of the L'OASIS project and the BELLA proposal has been praised by external reviewers. In addition, the superconducting magnet group is recognized as a well integrated group that has expertise on all aspects of superconducting magnet development from conductor development to magnet fabrication and through testing

### **Objective 3.3 Provide Efficient and Effective Communications and Responsiveness to Customer Needs**

Score: 3.0                      Grade: B                      Weighting: 20

#### **Objective 3.3 Performance Summary Statement:**

Communications with headquarters have improved as have budget and project planning. The lab must continue to improve its project management style and reach the goal of realism and accuracy in its projections.

The **PDG** five year plan, which was presented to the **OHEP** at a Sept, 2008 review, was criticized for its absence of realistic financial and manpower needs. **In** addition, the theory group did not review as well as similar efforts at other labs and the lack of long-term planning by management was noted in this effort.



U.S. DEPARTMENT OF

## Office of Science

# Laboratory Year-End Performance Assessment Report

Date:

1/18/2008

Headquarters Program Office Fiscal Year 2008 Evaluation of University of California for Management and Operation of the Lawrence Berkeley National Laboratory

Agency:

U.S. Dept of Energy

Program Office:

Office of Nuclear Physics

FY Funding Level: (Budget Authority) 24,756,000

Evaluator:

Phone Number:

E-mail Address:

### Goal 1.0 Provide for Efficient and Effective Mission Accomplishment

Goal Score: 3.72

Goal Grade: A-

#### Goal 1.0 Performance Summary Statement:

The LBNL nuclear physics group performs at a high level in all areas in mission accomplishment and merits a grade of A-:

- Has a leadership role in the national neutrino program with high impact in the field world-wide
- Significant accomplishments in nuclear structure and nuclear chemistry, including studies of heavy elements and neutron-proton degrees of freedom
- Leadership in Electron Cyclotron Resonance ion source and related technologies, important for advanced accelerator facilities
- High quality experimental research in study of hot, dense nuclear matter at RHIC
- Leading contributions to nuclear theory for the heavy-ion program
- Highly effective leadership in detector technology and fabrication aimed at the areas of nuclear structure, neutrino physics and heavy ion collisions.
- Strong publication record

The scores and grades for Goals 1-3 are based on the communication to NP at the February Laboratory Managers' Briefings, the LBNL Nuclear Science Division's self assessment, numerous Project Reviews (peer review), quarterly reports by project contract managers, NP program manager's observations at national meetings, and NP program manager's judgment.

#### Objective 1.1 Science and Technology Results Provide Meaningful Impact on the Field



Score: 3.8                      Grade: A                      Weighting: 35

**Objective 1,1 Performance Summary Statement:**

LBNL researchers carry out high priority research addressing national NP performance goals and milestones in relativistic heavy ion physics, neutrino physics, heavy element physics and chemistry, fundamental interactions, nuclear structure and reactions, and nuclear theory.

The programs and projects for the study of the physics of neutrinos are of very high quality. LBNL have leadership or significant roles in the Cryogenic Underground Observatory for Rare Events (CUORE) project (Italy) to search for neutrino-less double beta decay, the (Kamioka Liquid-scintillator Anti-Neutrino Detector) KamLAND experiment (Japan) to measure neutrino mixing parameters with reactor neutrinos, the Sudbury Neutrino Observatory (SNO) experiment (Canada) data analysis to determine neutrino mixing parameters with solar neutrinos, and R&D for the Majorana experiment to search for neutrino-less double beta decay. The SNO and KamLAND results provide the most stringent constraints on some of the mixing coefficients in the neutrino mixing matrix.

In the area of nuclear structure studies, use of the Berkeley Gas-Filled Separator (BGS) enabled first observation of high-K isomers in Lr-255 and Rf-256, the heaviest nuclei for which these isomers have been observed. The lifetime of the first excited state of C-16 was measured, resolving a puzzle related to claims of unequal proton and neutron matter distributions.

The Versatile ECR for Nuclear Science (VENUS) ion source focused on improving the high temperature oven using a rhenium crucible, enabling the first long-term uranium beam tests at medium intensities.

The 2008 DOE Science and Technology (S&T) panel review evaluated the Relativistic Heavy Ion Collider (RHIC) STAR experiment as being high-quality as demonstrated by many scientific measurements and numerous publications that have appeared in refereed journals. The Relativistic Nuclear Collisions (RNC) group has a vital presence in STAR collaboration and its publications continue to have an important impact on the field.

LBNL nuclear theorists have had significant impact in relativistic heavy ion physics, providing interpretations for RHIC data, especially in jet physics.

The nuclear data program makes an effective contribution to the national nuclear data program, particularly in the traditional area of evaluation of nuclear mass chains.

**Objective 1.2 Provide Quality Leadership in Science and Technology**

Score: 3.7                      Grade: A-                      Weighting: 25

**Objective 1.2 Performance Summary Statement:**

LBNL researchers have leadership roles for a number of projects including the Gamma-Ray Energy Tracking In-beam Nuclear Array (GRETINA) gamma-ray detector array, the U.S. involvement in the CUORE experiment, and the US. involvement in KamLAND. They play significant roles in the SNO data analysis, and research and development for the Majorana experiment.

A number of LBNL scientists played a significant role in the Nuclear Science Advisory Committee's long range planning process, including the chairmanship of the Facility for Rare Isotope Beams (FRIB) Task Force subcommittee.

Scientists at the 88-Inch Cyclotron are playing a national role in developing best practice standards for dosimetry for electronics testing in radiation environments.

The RNC group is regarded as having been successful in producing forefront physics and taking-on the leadership role in the R&D of the STAR Heavy Flavor Track (HFT) detector upgrade and Contractor Project Management of the CERN ALICE Electromagnetic Calorimeter (EMCAL) project. Some technical aspects of the RNC program are world-class.

DOE, in its response to last year's NSD Self-Assessment, acknowledged the leading contribution of the LBNL theory group to the RHIC experimental program.

NSD personnel work closely with the National Nuclear Data Center to provide leadership for the Nuclear Data Program and, within budgets provided, develop young talent for the field. They participate in workshops to train





new evaluators, particularly internationally.

**Objective 1.3 Provide and Sustain Outputs that Advance Program Objectives and Goals**

Score: 3.7                      Grade: A-                      Weighting: 25

**Objective 1.3 Performance Summary Statement:**

The Nuclear Science Division (NSD) scientists produced a significant body of work published in peer reviewed journals, with a total of 110 publications in heavy ions, low energy nuclear physics, nuclear astrophysics, nuclear theory and accelerator physics. A total of 120 invited talks were presented by staff members.

Publications and citations for the heavy ion program exceed the amount and/or quality typically expected for an excellent body of work. The LBNL Relativistic Nuclear Collision (RNC) group members are lead authors on about 1/3 of all STAR publications.

A total of eleven theses were awarded for research performed under mentorship of NSD scientists or as a result of work done at the facility.

The SNO and KamLAND papers are among the most cited papers in nuclear physics.

The NSD researchers for nuclear data provide evaluated data for a suite of mass chains on a regular rotating basis.

**Objective 1.4 Provide for Effective Delivery of Products**

Score: 3.6                      Grade: A-                      Weighting: 15

**Objective 1.4 Performance Summary Statement:**

The NSD-led projects such as GRETINA are within budget and baselined schedules.

The researchers and personnel of the 88-Inch Cyclotron provide highly effective support of the applied programs that use the facility, particularly the irradiation of microelectronics for space applications.

Program/project goals and/or milestones are largely met. RNC group has effectively responded to all DOE technical review recommendations. Response to a DOE recommendation made in the ALICE USA Science Review has been delayed by 6-months.

The NSD nuclear data program regularly publishes evaluations through the National Nuclear Data Center's (NNDC's) on-line services.

**Coal 2.0 Provide for Efficient and Effective Design, Fabrication, Construction and Operation of Research Facilities**

Goal Score: 3.69

Goal Grade: A-

**Goal 2.0 Performance Summary Statement:**

The LBNL nuclear physics group performs at a high level in the design, fabrication, construction and operation of research facilities and merits a grade of A-:

- Delivered 4837 of beam hours for research for the 88-Inch Cyclotron with a high reliability of 94%.
- Highly effective and efficient operations of the 88-Inch Cyclotron for both applied and basic research programs.
- Leadership and excellent performance for a number of important detector fabrication projects for the national program.
- Continued improvement and expansion of capabilities at the 88-Inch Cyclotron, such as a neutron production capability.
- Leading competency in the development of Electron Cyclotron Resonance ion sources for accelerator applications.

**Objective 2.1 Provide Effective Facility Design(s) as Required to Support Laboratory Programs (i.e.,**





**activities leading up to CD-2)**

Score: NA

Grade: NA

Weighting: 0

**Objective 2.2 Provide for the Effective and Efficient Construction of Facilities and/or Fabrication of Components (execution phase, Post CD-2 to CD-4)**

Score: NA

Grade: NA

Weighting: 0

**Objective 2.3 Provide Efficient and Effective Operation of Facilities**

Score: 3.7

Grade: A-

Weighting: 85

**Objective 2.3 Performance Summary Statement:**

The 88-Inch Cyclotron operated for 4837 hours in FY 2008 with 94% availability. The National Reconnaissance Office (NRO) and the U.S. Air Force (USAF) utilized approximately 1800 hours of beam time for their applied programs. Other applied programs utilized over 1100 hours of beam time.

Experiments include 87 using the BASE facility for radiation effects experiments, 31 for nuclear science runs, and 3 for beam studies. The 16 MeV/nucleon cocktail beam is being used increasingly and results from its use were featured in several talks at the 2008 Nuclear Space Radiation Effects Conference.

LBNL is the lead laboratory for the fabrication of three Major Items of Equipment (GRETINA, CUORE, and the ALICE EMCal project), and effectively plans and executes the projects.

**Objective 2.4 Utilization of Facilities to Grow and Support Lab's Research Base and External User Community**

Score: 3.6

Grade: A-

Weighting: 15

**Objective 2.4 Performance Summary Statement:**

The 88-Inch Cyclotron is used effectively as a base facility and infrastructure to develop capabilities for applied programs including those of the NRO and USAF. The accelerator capabilities enable the development of surrogate reaction techniques of interest to applied programs such as national security and advanced fuel cycles for reactors.

The 88-Inch Cyclotron staff exploits its competency in forefront Electron Cyclotron Resonance (ECR) ion sources to develop, test and utilize advanced ECR sources such as VENUS.

A new neutron beam capability has been initiated at the 88-Inch Cyclotron to be used by national security customers and high-energy physics testing.

**Goal 3.0 Provide Effective and Efficient Science and Technology Program Management**

Goal Score: 3.72

Goal Grade: A-

**Goal 3.0 Performance Summary Statement:**

The LBNL nuclear physics group performs at a high level in all areas in science and technology program management and merits a grade of A-:

- Highly active and well-recognized for involvement and leadership in national and international neutrino experiments.
- Recognized for stewardship of detector technologies for gamma rays, neutrinos, and high-energy particles and photons.
- Effectively manages the joint operations of the 88-Inch Cyclotron by the DOE, NRO, and USAF.
- Addition of joint faculty with the University of California Berkeley (UCB) in areas that strengthen the NSD staff.

**Objective 3.1 Provide Effective and Efficient Stewardship of Scientific Capabilities and Program Vision**

Score: 3.9

Grade: A

Weighting: 40

**Objective 3.1 Performance Summary Statement:**



The Nuclear Science Division (NSD) is recognized for its strengths in all aspects of the design, development and fabrication of detector systems such as GRETTNA. The NSD staff members continue to build on present efforts on the GRETINA project to plan for a full  $4\pi$  gamma-ray detector array, GRETA (Gamma-Ray Energy Tracking Array).

Staff members play a national leadership role in many aspects of non-accelerator neutrino physics, including a vision for the field, and leaders or among the leaders of several experiments and R&D efforts.

To recent joint appointments with the UCB Nuclear Engineering Department strengthen the NSD in the core areas of neutrino physics and instrumentation. A nuclear physics theory position has been successfully filled with a candidate who carries out research in the area of perturbative QCD and the physics of hadrons.

**Objective 3.2 Provide Effective and Efficient Science and Technology Project/Program Planning and Management**

Score: 3.7

Grade: A-

Weighting: 40

**Objective 3.2 Performance Summary Statement:**

The NSD manages the joint operations of the 88-Inch Cyclotron with the DOE, NRO, and USAF in a very effective manner, providing excellent capabilities for a spectrum of users.

The superconducting the VENUS ECR ion source suffered a significant failure during the past year. Management has devoted substantial resources to the diagnosis, repair and improvement of the VENUS, recognizing the importance of this technology for not only the local program, but the national program with the future FRIB.

The NSD has effectively managed the neutrino program transition from a program dominated by SNO and KamLAND to the new experiments, CUORE and Majorana R&D, as well as taking a lead role in the management of Deep Underground Science and Engineering Laboratory (DUSEL), an NSF initiative.

The NSD and the laboratory provide effective management for MIE projects such as GRETINA, CUORE and the ALICE EMCal.

**Objective 3.3 Provide Efficient and Effective Communications and Responsiveness to Customer Needs**

Score: 3.4

Grade: B+

Weighting: 20

**Objective 3.3 Performance Summary Statement:**

It is clear that the 88-Inch staff members communicate effectively with the community who are users of its capabilities for applications.

NSD staff members take part in the NP February Laboratory Program Manager's briefings, and the Division Leader makes telephone calls from time-to-time to the Physics Research Division Director. He has expressed the desire for an annual review of NSD programs by the Office of Nuclear Physics.

The NSD effectively communicates through numerous heavy-ion and low-energy project reviews.

The NSD leadership is responsive to requests for information by the office of Nuclear Physics.



## **Office of Science**

# **Laboratory Year-End Performance Assessment Report**

Date:

11/3/2008

Headquarters Program Office Fiscal Year 2007 Evaluation of University of California for Management and Operation of the Lawrence Berkeley National Laboratory

Agency:

U.S. Dept of Energy

Program Office:

Office of Workforce Development for Teachers and Scientists

FY Funding Level: (Budget Authority)

Evaluator:

Phone Number:

### **Goal 1.0 Provide for Efficient and Effective Mission Accomplishment**

Goal Score: 3.10

Goal Grade: B+

#### **Goal 1.0 Performance Summary Statement:**

LBNL's office of science education is fully integrated into the laboratory operation. The education office is used as an outreach mechanism providing many excellent resources for 'informal education' via educational web sites that help gain an understanding of the relationships among frontier science, technology, and society. They are the entry point for the laboratory as high school opportunities, undergraduate and educator research internships, and tours of the laboratory and Joint Genome Institute. They are a strong performer in delivering quality research experience for WDTs funded research interns.

#### **Objective 1.1 Science and Technology Results Provide Meaningful Impact on the Field**

Score: 3.1

Grade: B+

Weighting: 25

#### **Objective 1.1 Performance Summary Statement:**

- Students and educators are carefully matched with mentors where their talents can be developed and they are able to advance their research project and support their mentor.
- Students and educators are placed in challenging research positions that are in the laboratory core mission areas.

#### **Objective 1.2 Provide Quality Leadership in Science and Technology**

Score: 3.1      Grade: B+      Weighting: 30

#### **Objective 1.2 Performance Summary Statement:**



- LBNL is a strong performer in matching interns/educators with research experiences where their talent is at a level of competency where they can substantial contribute to the research. The education office is very effective in providing resources required to ensure that the intern and the **PI** equally benefit from the collaboration. Mentors are very willing to host intern/educators as a result of the reputation and dependability of the intern talent provided by the education office.

**Objective 1.3 Provide and Sustain Outputs that Advance Program Objectives and Goals**

Score: 3.1 Grade: B+ Weighting: 30

**Objective 1.3 Performance Summary Statement:**

- Research interns and educators are paired with researchers who are funded by the Office of Science and are contributing to SC research.
- The accomplishments of interns needs to be better validated by improving quality research abstracts.
- The educators in the DOE ACTS program should collaborative workshop the requirements of the "electronic portfolio" to make more useful to the participants as well as validating the accomplishments of the participants.

**Objective 1.4 Provide for Effective Delivery of Products**

Score: 3.1 Grade: B+ Weighting: 15

**Objective 1.4 Performance Summary Statement:**

- The large majority of WTDS supported interns/educators report through participant surveys a rewarding, but very challenging given the requires deliverables., laboratory experience.

**Goal 2.0 Provide for Efficient and Effective Design, Fabrication, Construction and Operation of Research Facilities**

Goal Score: 0.00

Goal Grade: NA

**Goal 2.0 Performance Summary Statement:**

**Objective 2.1 Provide Effective Facility Design(s) as Required to Support Laboratory Programs (i.e., activities leading up to CD-2)**

Score: NA Grade: NA Weighting: 0

**Objective 2.2 Provide for the Effective and Efficient Construction of Facilities and/or Fabrication of Components (execution phase, Post CD-2 to CD-4)**

Score: NA Grade: NA Weighting: 0

**Objective 2.3 Provide Efficient and Effective Operation of Facilities**

Score: NA Grade: NA Weighting: 0

**Objective 2.4 Utilization of Facilities to Grow and Support Lab's Research Base and External User Community**

Score: NA Grade: NA Weighting: 0



### **Goal 3.0 Provide Effective and Efficient Science and Technology Program Management**

Goal Score: 3.28

Goal Grade: B+

#### **Goal 3.0 Performance Summary Statement:**

WDTS sponsored laboratory research participants evaluation data report a high quality research experience. The mentor/protégé relationship was good, the research experience met expectations, the overall laboratory experience has strengthened commitments to pursue science/math/engineering careers but needed more time actually working on their research project.

#### **Objective 3.1 Provide Effective and Efficient Stewardship of Scientific Capabilities and Program Vision**

Score: 3.2

Grade: B+

Weighting: 20

##### **Objective 3.1 Performance Summary Statement:**

- Participants are exposed to the research throughout the laboratory through enrichment activities, science seminars, and collaborations with other interns.

#### **Objective 3.2 Provide Effective and Efficient Science and Technology Project/Program Planning and Management**

Score: 3.2

Grade: B+

Weighting: 40

##### **Objective 3.2 Performance Summary Statement:**

- Interns/educators are given an opportunities to see science career that are available to them and provided direction and encouragement to pursue them.
- The education office is fully aware of DOE and SC's future research thrusts and manages placements that are of mutual benefit to the laboratory ,and future the researcher(s)

#### **Objective 3.3 Provide Efficient and Effective Communications and Responsiveness to Customer Needs**

Score: 3.4

Grade: B+

Weighting: 40

##### **Objective 3.3 Performance Summary Statement:**

- The science education office is responsive to customer needs and do effectively communicate and complete program deliverables.
- The manager of the education office has been instrumental in gaining visibility for WDTS's model of experiential learning for pre-service teachers and has leveraged that into a collaboration with California State University with corporate funding.





**APPENDIX B**  
**NON-OFFICE OF SCIENCE**  
**FY 2008**  
**SCIENCE AND TECHNOLOGY EVALUATION**  
**OF**  
**LAWRENCE BERKELEY NATIONAL LABORATORY**

<b>Program Area</b>	<b>Page</b>
<b>Office of Energy Efficiency and Renewable Energy (EERE)</b>	<b>B-2</b>
<b>Office of Civilian Radioactive Waste Management (RW)</b>	<b>B-31</b>
<b>Office of Fossil Energy (FE)</b>	<b>B-36</b>

These narratives have been converted using optical character reading software. While reasonable attempts were made to correct any errors resultant from the conversion process some errors may exist and we apologize in advance for them. Original documents obtained by the Berkeley Site Office are available upon request.



Department of Energy  
Washington, DC 20585  
November 14, 2008

Ms. Aundra Richards  
Manager, Berkeley Site Office Lawrence  
Berkeley National Laboratory 1 Cyclotron  
Road  
MS-90,1023  
Berkeley, California 94720

SUBJECT: The Office of Energy Efficiency and Renewable Energy's Performance Evaluation  
of the University of California as the Management and Operating Contractor  
for the Lawrence Berkeley National Laboratory

Dear Ms. Richards:

The Office of Energy Efficiency and Renewable Energy (EERE) has completed its evaluation of the *University of California's* performance in managing science and technology activities at the Lawrence Berkeley National Laboratory (LBNL) for the performance period beginning October 1, 2007, and ending September 30, 2008. The evaluation report is enclosed for your information.

Six of the ten EERE programs, having obligated \$1.0 million or more to LBNL, submitted evaluations. The programs are: Building Technologies; the Federal Energy Management Program; Geothermal; Hydrogen, Fuel Cells & Infrastructure Technologies; Industrial Technologies; and, Vehicle Technologies.

For fiscal year 2008, the Office of Science asked EERE to provide only numerical grades to ensure compatible scores; as a result, we used a numerical rating scale for all of the laboratories. An EERE grade of 3.1 or higher (equivalent to a B+) signifies that the laboratory's achievements toward the performance goals translate to substantive accomplishments and results.

EERE graded LBNL against three performance goals. LBNL received the following numerical scores (and what would be equivalent letter grades) for these goals.

Goal 1: Accomplish Mission -- numerical score of 3.79, or A

Goal 2: Effective and Efficient Operation of Facilities - numerical score of 3.78, or A

Goal 3: Effective Science and Technology Research Project and Program  
Management - numerical score of 3.82, or A

Printed with soy ink on recycled paper





If you have any questions concerning this evaluation, please contact Mr. Jim Fremont via e-mail at [james.fremont@ee.doe.gov](mailto:james.fremont@ee.doe.gov) or by phone at (202) 586-5735.

Sincerely,

Steven G. Chalk  
Deputy Assistant Secretary  
for Renewable Energy  
Office of Technology Development Energy Efficiency and Renewable Energy  
David E. Ro  
Deputy Assist Secretary  
for Energy Efficiency  
Office of Technology Development Energy Efficiency and Renewable Energy

Rita L. Wells  
Acting Deputy Assistant Secretary  
Office of Business Administration  
Energy Efficiency and Renewable Energy

Enclosure

cc: Joseph Krupa  
Institutional Program Manager



U.S. Department of Energy  
Office of Energy Efficiency and Renewable Energy

Performance Evaluation Report of the  
University of California for  
Management and Operations of Science and Technology at the

Lawrence Berkeley National Laboratory

For the period October 1, 2001, to September 30, 2008



## EXECUTIVE SUMMARY

The Office of Energy Efficiency and Renewable Energy (EERE) participates in the award-fee evaluation process to assess the performance of a National Laboratory in the area of science and technology. This requirement originates from the annual "Standards of Performance-based Fee" clauses negotiated between the U. S. Department of Energy (DOE) and a contractor managing and operating (M&O) a National Laboratory. Existing contracts call for annual evaluations. The result of the evaluation -- the overall weighted score for the science and technology goals awarded by all DOE programs -- determines the percentage of the available performance-based fee that the M&G contractor earns. EERE prepared this evaluation as its input to the DOE award-fee evaluation of University of California's operation of the Lawrence Berkeley National Laboratory (LBNL). It assesses LBNL's performance of work for programs in EERE from October 1, 2007, to September 30, 2008.

Each reporting EERE program that obligated \$1.0 million or more to LBNL during the performance period evaluated the Laboratory's performance using the Performance Goals and Objectives specified by DOE. The overall rating for each Performance Goal represents a weighted average grade of ratings received from EERE program offices. The computation uses each program's year-to-date obligations at LBNL as of August 31, 2008, as the weighting factor.

The following EERE programs submitted evaluations: Building Technologies Program; Federal Energy Management Program (FEMP); Geothermal Technologies Program (GTP); Hydrogen, Fuel Cells and Infrastructure Technologies Program; Industrial Technologies Program (ITP); and Vehicle Technologies Program (VTP).

EERE rated LBNL's performance for fiscal year 2408 with a score of 3.79 for Goal 1: Accomplish Mission, 3.7\$ for Goal 2: Effective and Efficient Operation of Facilities; and 3.82 for Goal 3: Effective Science and Technology Research Project and Program Management.

LBNL's total score for fiscal year 2008 is 3.80. Numerical Grades by Performance Goal	Goal 1: Accomplish Mission	Goal 2: Effective and Efficient Operation of Facilities	Goal 3: Effective Science and Technology Research Project and Program Management
Building Technologies Program	3.50	3.60	3.75
Federal Energy Management Program	3.80	3.68	3.57
Geothermal Technologies Program	3.65	3.60	3.60
Hydrogen, Fuel Cells and Infrastructure Technologies Program	3.27	3.40	3.87
Industrial Technologies Program	3.90	4.00	3.70
Vehicle Technology Program	4.15	4.00	4.00
<b>Weighted Average Grade</b>	3.79	3.78	3.82
<b>Final Numerical Result</b>	3.8		

Grades of 3.3 or higher signify that LBNL's work toward a goal translates to substantive performance and results for the program. The following chart illustrates how numerical scores translate into letter grades.

Final Grade	A+	A	A-	B+	B	B-	C+	C	C-	D	F
<b>Total Score</b>	<b>4.3-4.1</b>	<b>4.0-3.8</b>	<b>3.7-3.5</b>	<b>3.4-3.1</b>	<b>3.0-2.8</b>	<b>2.7-2.5</b>	<b>2.4-2.1</b>	<b>2.0-1.8</b>	<b>1.7-1.1</b>	<b>1.0-0.8</b>	<b>0.7-0</b>



## **INTRODUCTION**

This evaluation has been prepared as part of the DOE contractual obligation to assess the University of California's performance for M&4 of science and technology at LBNL. Specifically, it assesses LBNL's support of EERE program offices in science and technology and its ability to assist these program offices in maintaining the overall EERE mission: to strengthen America's energy security, environmental quality and economic vitality through public-private partnerships.

This evaluation report, covering the period from October 1, 2007, through September 30, 2008, comprises five sections. The first section highlights the given performance goals, objectives and measures provided to each DOE EERE technical program office. The second section addresses the process followed to grade the laboratory's performance. The third section presents the overall grades resulting from the evaluation. The fourth section lists key achievements and areas of concern. The fifth and final section provides guidance for the next performance period.

## **PERFORMANCE GOALS, OBJECTIVES, AND MEASURES**

This evaluation focuses on grading the contractor's performance against Performance Goals as described below. Each evaluator measures progress against these Performance Goals using a set of Performance Objectives and Performance Measures, defined as follows:

- Performance Goal: This is a general overarching statement of the desired outcome for each major performance area.
- Performance Objective: An objective is a statement of desired results for an organization or activity within a major performance area.
- Performance Measure: A performance measure provides a reviewer a quantitative or qualitative method for characterizing performance to assist in assessing achievement of the corresponding Performance Objective.

The Performance Goals and Performance Objectives used by EERE, for the most part, adopt the standardized versions of goals and objectives defined by the Office of Science, as stated in the following:

- Goal 1: Accomplish Mission

Objective 1.1: Accomplish Mission

Objective 1.2: Leadership

Objective 1.3: Produce high quality, original and creative results that advance science and technology (recognition of science and technology breakthroughs). Objective 1.4: Delivery

- Goal 2; Effective and Efficient Operation of Facilities

- Objective 2.1: Provide effective and efficient operation of facilities supporting the EERE program.

- Goal 3: Effective Science and Technology Research Project and Program Management

- Objective 3.1; Effective program vision and leadership.
- Objective 3.2: Effective and efficient science and technology project and program planning and management.
- Objective 3.3: Effective and efficient communications and responsiveness to EERE and Project Management Center (PMC) needs.

EERE also adjusted the Performance Measures under Goal 1 to include success in meeting program milestones and other criteria appropriate to applied research. EERE uses only one



Performance Objective under Goal 2, namely the effective and efficient operation of facilities to support EERE programs. FERE only constructs facilities at the National Renewable Energy Laboratory (NREL).

## **EVALUATION PROCESSES: NUMERICAL SCORES AND AVERAGING**

After collecting the scores, EERE weighted them against specific program obligations for fiscal year 2008 at LBNL, as reported in the DOE Standard Accounting and Reporting System as of August 31, 2008. The following table lists the total funding obligated by each program.

<b>PROGRAM OFFICE</b>	<b>Year-To-Date Obligations at LBNL as of August 31, 2008</b>
Building Technologies Program	\$7,975,972
Federal Energy Management Program	\$2,304,852
Geothermal Technologies Program	\$1,341,000
Hydrogen, Fuel Cells and Infrastructure Technologies Program	\$1,933,000
Industrial Technologies Program	\$2,346,789
Vehicle Technology Program	\$9,157,282
<b>TOTAL</b>	<b>\$25,058,895</b>

EERE then computed a weighted average score for each Performance Goal. The following example illustrates the algorithm used to compute a weighted average.

<b>Program</b>	<b>Numerical Score</b>	<b>Fiscal Year 2008 Obligations</b>	<b>Weighted Score</b>
One	4.3	\$2,000,000	8,600,000
Two	3.9	\$20,000,000	78,000,000
Three	3.3	\$6,000,000	19,800,000
<b>SUM</b>		<b>\$28,000,000</b>	<b>105,400,004</b>
<b>Weighted Average (Sum of Weighted Score/Sum of FY 2008 Obs)</b>			<b>3.8</b>

## **OUTCOME BY PERFORMANCE GOAL**

EERE rated LBNL's performance for fiscal year 2008 with a score of 3.79 for Goal I: Accomplish Mission; 3.78 for Goal 2: Effective and Efficient Operation of Facilities; and 3.82 for Goal 3: Effective Science and Technology Research Project and Program Management.



The following table highlights the numerical grade issued by each of the program offices by Performance Goal and the overall grade for EERE.

<b>Numerical Grades by Performance Goal</b>	<b>Goal 1: Accomplish Mission</b>	<b>Goal 2: Effective and Efficient Operation of Facilities</b>	<b>Goal 3: Effective Science and Technology Research Project and Program Management</b>
Building Technologies Program	3.5	3.6	3.75
Federal Energy Management Program	3.8	3.68	3.57
Geothermal Technologies Program	3.65	3.6	3.6
Hydrogen, Fuel Cells and Infrastructure Technologies Program	3.27	3.4	3.87
Industrial Technologies Program	3.9	4.0	3.7
Vehicle Technology Program	4.15	4.0	4.0
<b>Weighted Average Grade:</b>	<b>3.79</b>	<b>3.78</b>	<b>3.82</b>

Based upon the scores assigned by each program office for each Performance Goal and Objective, LBNL's overall final numeric score is 3.75, as calculated in the table below:

<b>GOAL</b>	<b>EERE Weight</b>	<b>Weighted Numerical Score (All Programs)</b>	<b>Portion of Final Score</b>
Goal 1: Accomplish Mission	60%	3.79	2.27
Goal 2: Effective and Efficient Operation of Facilities	10%	3.78	0.38
Goal 3: Effective Science and Technology Research Project and Program Management	30%	3.82	1.15
Final Numerical Score	3.80		

The following chart illustrates how numerical scores translate into letter grades.

Final Grade	A+	A	A-	B+	B	B-	C+	C	C-	D	F
----------------	----	---	----	----	---	----	----	---	----	---	---



Final Grade	A+	A	A-	B+	B	B-	C+	C	C-	D	F
<b>Total Score</b>	<b>4.3-4.1</b>	<b>4.0-3.8</b>	<b>3.7-3.5</b>	<b>3.4-3.1</b>	<b>3.0-2.8</b>	<b>2.7-2.5</b>	<b>2.4-2.1</b>	<b>2.0-1.8</b>	<b>1.7-1.1</b>	<b>1.0-0.8</b>	<b>0.7-0</b>

## SELECTED EXAMPLES OF ACHIEVEMENTS AND DEFICIENCIES

EERE, in the order of each Performance Goal, has highlighted selected major achievements recognized throughout fiscal year 2008. It also addresses certain areas within the LBNL research and development environment needing management attention.

### GOAL 1: ACCOMPLISH MISSION with the following objectives:

- Accomplish Mission;
- Leadership;
- Produce high-quality, original and creative results that advance science and technology (recognition of science and technology breakthroughs); and
- Delivery.

## SIGNIFICANT ACHIEVEMENTS

### *Building Technologies Program Objective 1.1*

- LBNL staff has been hard working and very responsive to the fast changing needs of the appliance standards program. LBNL continued in fiscal year 2008 with its significant impact on the window industry. Leading companies routinely seek LBNL advice on the development of new software, product designs, analysis, and partner collaboration. For example, a license agreement was completed with a new research and development company for the reflective hydride electrochromic development project. Private investment in the first year will equal our entire investment over the last four years.

### *Objective 1.2*

- LBNL continues to exhibit strong industry leadership. For example, LBNL plays key roles within the National Fenestration Rating Council arena and within the American Society of Heating, Refrigerating, and Air-Conditioning Engineers (ASHRAE) Technical Committee 4.5. LBNL also has contributed significantly to our international leadership.

### *Objective 1.3*

- LBNL delivered state of the art design and rating software to the industry. The latest software conducts extremely complex computations for the lay user. Sophisticated optical characteristics of multiple layers including blinds, coatings, multiple glazings, etc. are all combined into a simple solar heat gain coefficient number. New commercial building simulation software was released to the industry to show the value added benefits of advanced glazings and the associated energy and peak demand impacts of alternative designs.

### *Objective 1.4*

- LBNL staff has been hard working and very responsive to the fast changing needs of the appliance standards program.
- *Federal Energy Management Program*

### *Objective 1.1*

- LBNL contributed significantly to the accomplishment of FEMP's mission, including technical input and evaluation related to the recompete of the Energy Service Performance Contract (ESPC) indefinite



delivery/indefinite quantity, revision and updating of the program's Monitoring and Verification protocols, review of and input to the ESPC training materials and provision of a very skilled trainer for the ESPC workshops, development of the study, mandated therein, of non-building applications, and taking a lead role in off site planning sessions for the FEMP/ESPC team. LBNL took the lead in developing and preparing a matrix of new technologies to include in Energy Savings Performance Contracts. The LBNL technical team developed a protocol for use of the matrix in the ESPC review process and has provided presentation to the energy services companies.

*Objective 1.2*

- LBNL remained a leader in building related technologies and in sponsoring or monitoring the progress of research in a range of emerging technologies. They are instrumental in keeping FEMP staff apprised of new developments. They have been proactive in taking the lead in development of the joint DOE/Department of Defense (DOD) study of non-building applications mandated by the Energy Independence and Security Act of 2007 (EISA). LBNL designed and provided technical support for a data center survey of the DOE facilities. Technical specialists provide support to the DOE Data Center Energy Efficiency Working Group by giving a webinar on energy efficiency and a webinar on the use of DOE's "DC Pro" tool to DOE data center operators.

*Objective 1.3*

- LBNL continued its critical support of FEMP in identifying efficiency and renewable project opportunities (including State Public Benefit opportunities) for Federal agencies in all geographic locations, assisting agencies in securing Public Benefit funds, preparing regional newsletters assisting at FEMP workshops, and in the implementation of the Secretary's Transformational Energy Action Management (TEAM) initiative. LBNL developed two new Best Practice Guides for Laboratories; Commissioning Ventilated Containment Systems in the Laboratory and Aerosol Ductwork Sealing in Laboratory Facilities. LBNL also developed a guide for modeling the design of laboratories using Appendix G of [ASHRAE 90.1-2007](#). Technical experts from LBNL gave presentations on data centers and new technologies at the GovEnergy conference and also gave a presentation on data center energy efficiency at a General Services Administration Information Technology Conference.

*Objective 1.4*

- None

- *Geothermal Technologies Program*

*Objective 1.1*

- LBNL published a report for the 42nd US Rock Mechanics Symposium in which LBNL analyzed the relative contributions to the cause and mechanisms of injection-induced microearthquakes at The Geysers geothermal field in California. The analysis shows that the most important cause for injection-induced microearthquakes is cooling and associated thermal-elastic shrinkage of the rock around the injected fluid. Cooling-induced shear slip along fractures is the dominant mechanism of injection-induced microearthquakes at The Geysers. This has significant implications for DOE's Enhanced Geothermal Systems (EGS) research for: 1) creating new permeability by shear slip and, 2) induced seismicity that can result from EGS injection.

*Objective 1.2*

- LBNL was a major contributor to the 2008 report "Evaluation of Enhanced Geothermal Systems Technology" which dealt with the technological requirements to commercialize EGS, the main focus of DOE's Geothermal Program. LBNL contributed to the geosciences and resource portions of the evaluation, specifically the steps required to identify a suitable EGS site, create a reservoir, and operate and maintain the EGS reservoir. LBNL collaborated with DOE, Idaho National Laboratory, Sandia National Laboratory, NREL, TMS Inc. and Sentech, Inc. to complete the report. This report is available on the DOE GTP website.

*Objective 1.3*

- LBNL produced high quality creative results for GTP. For research on isotopic constraints on the chemical evolution of geothermal fluids at Long Valley, California, LBNL provided the first evidence that calcium isotopes may trace and provide definitive evidence of calcite precipitation along fluid





flow paths in geothermal systems. LBNL also investigated the use of chelating agents as potential chemical stimulation agents for enhanced geothermal systems. This is a novel and creative approach that may be superior to traditional calcite dissolution methods that use acids to remove scale.

*Objective 1.4*

- LBNL meets milestones and deliverables due dates the majority of the time.
- *Hydrogen, Fuel Cells and Infrastructure Technologies Program*

*Objective 1.1*

- LBNL demonstrated through characterization measurements of mixtures (ionic liquids and doped polymers) that membranes with conductivities close to or greater than 0.1 S/cm at 120°C in the absence of water are possible.

*Objective 1.2*

- LBNL published three peer reviewed papers and gave seven talks at conferences and workshops, most of which were invited. LBNL provided leadership for two DOE fuel cell proposals with extensive collaborations with Los Alamos National Laboratory and 3M, among others. LBNL also participated in five other DOE proposals.

*Objective 1.3*

- The membrane project is very innovative and is one of the few membrane projects that hold the potential to meet the DOE conductivity targets. The modeling effort is innovative and important for setting appropriate targets.

*Objective 1.4*

- None

- *Industrial Technologies Program*

*Objective 1.1*

- LBNL personnel have assisted ITP in Best Practices activities related to improving the energy efficiency of data centers, rather than conducting research. A clear significant achievement by LBNL personnel is the creation of the "DC 4 Pro" software which is used to evaluate the energy efficiency of data centers. This highly regarded software is now in beta testing.

*Objective 1.2*

- LBNL personnel, especially William Tschudi are very highly regarded by the data center community. In past years they created a data center energy efficiency technology roadmap for the California Energy Commission (CEC). Many of the steps needed to achieve more efficient data centers have been demonstrated by LBNL personnel. Indeed, LBNL personnel have been active in data center evaluations and in conducting projects to demonstrate data center energy efficiency techniques that were identified in the CEC roadmap. This experience and leadership has been used in creating "DC Pro" software and in assisting ITP in organizing the workshop to create the next generation vision and roadmap for server-based IT and communications facilities.

*Objective 1.3*

- The "DC Pro" software is pioneering, unique, and of high quality. It is expected to be of significant value to the data center community to enable the community in the energy efficiency area. The software is new and has just been released for beta test.

*Objective 1.4*

- LBNL delivery has been consistently timely. For example, LBNL: (1) developed four system assessment standards under the American Society of Mechanical Engineers on schedule to be ready for field test and in support of the overall American National Standards Institute (ANSI) accredited Plant Certification program; (2) created a proposal for ANSI leadership on the International Standards Organization (ISO) Project Committee 242 energy management standard on time so that the US obtained the ISO PC 242 Secretariat leadership role; (3) developed a draft ISO 50001 energy management standard for consideration by ISO PC 242 on time; and (4) developed and released the "DC Pro" software on schedule.



- *Vehicle Technologies Program*

- *Objective 1.1*

- LBNL researchers received three of the top five combined reviewer scores in the Batteries for Advanced Transportation Technologies (BATT) program at the 2008 OVT merit review meeting. During 2008, LBNL researchers in the BATT program have met, or are on schedule to meet, 19 of their 20 CPS milestones. One milestone has been delayed by three months due to a post-doctoral fellow being assigned to another task.

- *Objective 1.2*

- Professor John Newman of UC Berkeley won the 2008 Vittorio de Nora Award in Electrochemical Engineering and Technology from the Electrochemical Society (ECS). The award recognizes outstanding contributions to engineering and technology directed toward the utilization of electrochemical phenomena and processes. The award is granted biennially, and was at the ECS 2008 spring meeting in Phoenix, Arizona.
    - Professor Nitash Balsara, of UC Berkeley, received a Research and Development (R&D)-100 Award for his work on polymer electrolytes for high energy (plug-in hybrid electric vehicles and electric vehicles) rechargeable Lithium-metal batteries which was conducted under the BATT program. Dr. Balsara uses composite polymer electrolytes comprised of an extremely hard, but nonconducting polystyrene-based portion to block dendrite formation, interwoven with a conducting polyethylene oxide based portion to permit Lithium diffusion. The R&D-100 Award is generally considered one of the most prestigious technology-oriented awards and provides a mark of excellence known to industry, government, and academia. Efforts to commercialize this patented technology are being pursued by a start-up company located in Berkeley called Seeo, Inc.
    - Researchers in the BATT program received a third place award at the April 2008 CleanTech Innovation contest sponsored by the Center for Entrepreneurship and Technology of the UC Berkeley. The award was for work that led to the discovery that the amount of cobalt in layered-mixed-transition-metal-oxide electrodes can be reduced by half with no loss in electrode performance. This should result in considerable cost savings in batteries for vehicular applications.
    - A poster by BATT researchers Gao Liu, H. H. Zheng, and Vince Battaglia was one of 12 winners of the "Most Excellent Poster Award," out of 600 posters presented at the 14th International Meeting on Lithium Ion Batteries (IMLB) in Tianjin, China in June. IMLB is a major international conference on Lithium battery technology and the poster award is the sole award presented at the conference.

- *Objective 1.3*

- Synthesis and Characterization of Novel Cathodes for Lithium-Ion Batteries: Researchers in the BATT Program have been investigating maximizing the content of the low-cost manganese (Mn) and minimizing the content of the high cost and rare cobalt (Co) in the layered cathode material, LiMO<sub>2</sub> (M = transition metal). Initial studies allowed an upper limit of 50 percent Mn to be achieved and a minimum of 10 percent Co, while still maintaining high capacity and rate.
    - Commercialization: A number of BATT projects have resulted in commercialization activities in 2008, these include: (1) Actacell Inc. is commercializing conductive polymer coatings and a new LiFePO<sub>4</sub> fabrication method developed by Professor Manthiram, which is used to fabricate high power Lithium ion cells; (2) Seeo Inc., a start-up company, is commercializing composite polymer electrolytes for Lithium metal rechargeable batteries by Professor Balsara; (3) conductive, electroactive polymers developed by Professor Goodenough have been licensed to Hydro Quebec, the world's leading supplier of this material; and (4) the hydrothermal synthesis technique for LiFePO<sub>4</sub> developed by Dr. Whittingham has been licensed to Phostech, with plans to produce 1,200 tons in 2008.

- *Objective 1.4*

- During 2008, LBNL researchers in the BATT program have met, or are on scheduled to meet,



95 percent of their Corporate Planning System milestones. One of 20 milestones has been delayed by three months due to a post-doctoral fellow being assigned to another task.

## NOTABLE ACHIEVEMENTS

### *Building Technologies Program*

#### *Objective 1.1*

- LBNL extended the capabilities of DOE's EnergyPlus simulation program to include new refrigeration components, systems, and configurations which directly supports work of Commercial Building Initiative National Accounts and the Commercial Building Energy Alliances. .

#### *Objective 1.2*

- Collaboration is a positive but can become a negative in federal regulatory activities if it appears that strong collaboration with some stakeholders is at the expense of others. Greg Rosenquist has done an outstanding job of gaining respect and trust from stakeholders with different perspectives. High quality, thorough development of all documentation, methods and algorithms for new refrigeration systems in EnergyPlus.

#### *Objective 1.3*

- LBNL has made significant progress, however General Counsel and DOE staff have expressed concerns about the quality of documents in recent months. They are finding multiple instances where information was copied from one document and inserted into another without even changing the names of products or citations. This series of errors has caused confidence in the quality of documents to erode and has raised the level of scrutiny by General Counsel slowing down the concurrence process.
- LBNL staff from the heating products team has been assigned by LBNL management to work on rulemakings for white goods products. This will take closer oversight and supervision to be successful.

#### *Objective 1.4*

- LBNL has completed all major deliverables. Due to a variety of priority issues including demands from industry, LBNL has been able to juggle the impacts to deliverable schedule and seeks agreement to any changes by the DOE technology development manager. LBNL is on time and in budget.
- *Federal Energy Management Program Objective 1.1*
  - None *Objective 1.2*
  - None *Objective 1.3*
  - None *Objective 1.4*
  - LBNL's support of FEMP has been, in large measure, in the areas of technology assessment and deployment rather than with unique science and technology development. Support, as noted in previous comments, has been, on the whole, excellent and timely. However, in the areas of sustainability and renewable power purchases it has been uneven. While the work delivered has been of good quality and has addressed a unique need within the Federal government, timeliness has been a problem. This was due to the fact that, of the staff assigned, one was very experienced and the other needed considerable attention and time from FEMP staff to be brought up to speed.

- *Geothermal Technologies Program*

#### *Objective 1.1*

- LBNL published a report in the Proceedings of Geothermal Resources Council 2008 Annual Meeting on the isotopic constraints on the chemical evolution of geothermal fluids at Long Valley, California. The research confirmed that the variations in water isotopes along the flow path reflect mixing of a single hydrothermal fluid with local groundwater.

#### *Objective 1.2*

- LBNL wrote a paper on the design, creation, analysis, and management of EQS. The paper provided a brief assessment of the current status of modeling and stimulation for EGS and offered suggestions to DOE for future research and development programs in EGS. Thirteen suggestions for future research activities were presented.



*Objective 1.3*

- None *Objective 1.4*
- None

- *Hydrogen, Fuel Cells and Infrastructure Technologies Program*

*Objective 1.1*

- LBNL demonstrated, through simulation, the necessary gas permeability target for high-temperature membranes, including the effects of gas crossover and pinholes.

*Objective 1.2*

- LBNL provided leadership in the promotion of water-free membranes for fuel cells.

*Objective 1.3*

- None

*Objective 1.4*

- All scheduled milestones were met during the period and pending milestones appear to be at least on schedule if not ahead of schedule.

- *Industrial Technologies Program*

*Objective 1.1*

- LBNL personnel have begun to provide assistance to ITP's R&D activity related to server based data centers and telecom central offices. This activity has thus far focused on a workshop to be held in Silicon Valley. An LBNL-retained consultant has arranged for free meeting space from Yahoo! Inc., has identified two other sponsors, and has interfaced with and helped recruit participants for the workshop.
- Also, LBNL developed four system assessment standards in support of the overall ANSI plant certification program. LBNL created a proposal for ANSI leadership on ISO Project committee 242 energy management standards which enabled the users to realize a leadership role.

*Objective 1.2*

- LBNL has been active in other areas of ITP's Best Practices activity. They have provided technical information needed to support ITP recognition and certification activities, ISO-related project documentation, case studies, and various partnership activities.

*Objective 1.3*

- None *Objective 1.4*
- None

- *Vehicle Technologies Program*

*Objective 1.1*

- LBNL has held a number of leadership positions in influential professional societies, including: Chair of the Council of Sections of the ECS; Chair of the Selection Committee of the Student Research Awards of the Battery Division of the ECS; and Vice-Chair of the Electrochemical Energy Conversion and Storage Division of the International Society of Electrochemistry.
- LBNL has consistently provided cutting edge leadership, delivering results on or ahead of schedule in important technology and research areas.

*Objective 1.2*

- None

*Objective 1.3*

- None *Objective 1.4*
- None



## NOTABLE DEFICIENCIES

- *Building Technologies Program Objective 1.1*

- None Objective 1.2
- None Objective 1.3
- None Objective 1.4
- None

- *Federal Energy Management Program Objective 1.1*

- None Objective 1.2
- None Objective 1.3
- None Objective 1.4
- None

- *Geothermal Technologies Program*

- *Objective 1.1*

- None

- *Objective 1.2*

- None Objective 1.3
  - None Objective 1.4
  - None

- Hydrogen, Fuel Cells and Infrastructure Technologies Program*

- *Objective 1.1*

- There has been very little progress on hydrogen storage tasks at LBNL and the polymer synthesis program is behind schedule.

- *Objective 1.2*

- More peer reviewed publications are required to increase external recognition.

- *Objective 1.3*

- The synthesis effort has been too slow to provide enough materials to test. The modeling effort does not have sufficient experimental validation.

- *Objective 1.4*

- Hydrogen storage milestones are behind schedule due to the late arrival of funding.

- *Industrial Technologies Program*

- *Objective 1.1*

- None Objective 1.2
  - None Objective 1.3
  - None Objective 1.4
  - None

- *Vehicle Technologies Program*

- *Objective 1.1*

- None Objective 1.2
  - None Objective 1.3



- None *Objective 1.4*
- None
- *Building Technologies Program*
  - Objective 1.1*
  - None ,
  - Objective 1.2*
  - None
  - Objective .1.3*
  - None
  - Objective 1.4*
  - None
- *Federal Energy Management Program*
  - Objective 1.1*
  - None
  - Objective 1.2*
  - None
  - Objective .1.3*
  - None
  - Objective 1.4*
  - None
- *Geothermal Technologies Program*
  - Objective 1.1*
  - None
  - Objective 1.2*
  - None
  - Objective 1.3*
  - None
  - Objective .1.4*
  - None
- *Hydrogen, Fuel Cells and Infrastructure Technologies Program*
  - Objective .1.1*
  - None
  - Objective 1.2*
  - LBNL has not provided compelling proof that the water-free structures are feasible.
  - Objective 1.3*
  - None
  - Objective .1.4*
  - None



- *Industrial Technologies Program*

- *Objective 1.1*

- None

- *Objective,1.2*

- None

- *Objective 1.3*

- None

- *Objective 1.4*

- None

- *Vehicle Technologies Program*

- *Objective 1.1*

- None

- *Objective 1.2*

- None

- *Objective 1.3*

- None

- *Objective 1.4*

- None

#### **SUPPORTING COMMENTS**

- *Building Technologies Program*

- *Objective 1.1*

- None

- *Objective 1.2*

- None

- *Objective 1.3*

- None

- *Objective 1.4*

- None

- *Federal Energy Management Program*

- *Objective 1.1*

- None

- *Objective 1.2*

- None

- *Objective 1.3*

- None *Objective 1.4*

- None

- *Geothermal Technologies Program Objective 1.1*

- None *Objective*

- 1.2

- None *Objective 1.3*



- None *Objective 1.4*
- None
- *Hydrogen, Fuel Cells and Infrastructure Technologies Program*
  - Objective 1.1*
    - The results discussed previously demonstrate that the DOE targets for membrane conductivity are achievable. Modeling of polymer properties is important to define membrane targets and consequences if the targets are not met. The polymer synthesis activities are behind schedule due to the late start of the project and LBNL needs to replace staff that left for industrial jobs.
  - Objective 1.2*
    - Some of the members on the membrane project team were not convinced of the merits of the project. LBNL corrected this and nearly all team members are now convinced of the benefits of the effort. *Objective 1.3*
  - None *Objective 1.4*
  - The main milestone for the membrane project is not due during the present period of assessment.
- *Industrial Technologies Program Objective 1.1*
  - None *Objective 1.2*
  - None *Objective 1.3*
  - None *Objective 1.4*
  - None
- *Vehicle Technologies Program Objective 1.1*
  - LBNL is the lead laboratory for the multi-million dollar, multi-university exploratory battery research program, BATT, and also contributes diagnostic expertise to D4E's applied research program. The investigators at LBNL are highly regarded, world-class scientists who perform cutting edge research toward understanding the fundamental issues impeding the development of electric vehicles, hybrid electric vehicles, and plug-in hybrid electric vehicles (PHEV) batteries. LBNL's contributions are critical to VTP realizing its mission goals.
- *Objective 1.2*
  - None *Objective 1.3*
  - None *Objective 1.4*
  - None





**GOAL 2: EFFECTIVE AND EFFICIENT OPERATION OF FACILITIES** with the following objective:

- Provide effective and efficient operation of facilities supporting the EERE program.

**SIGNIFICANT ACHIEVEMENTS**

- *Building Technologies Program*

*Objective 2.1*

- LBNL initiated a new highly leveraged test bed evaluation of a variety of daylighting and cooling mitigation technologies with industry, the State of California and other partners. LBNL has also significantly improved its optical properties facility to the state of the art; paramount in the execution of maintaining a global data base on glazing properties.

- *Federal Energy Management Program*

*Objective 2.1*

- None

- *Geothermal Technologies Program*

*Objective 2.1*

- None

- *Hydrogen, Fuel Cells and Infrastructure Technologies Program*

*Objective 2.1*

- None

- *Industrial Technologies Program Objective*

*2.1*

- None

- *Vehicle Technologies Program*

*Objective 2.1*

- Energy storage technologies, especially batteries, are critical enabling technologies for the development of advanced, fuel-efficient, light- and heavy-duty vehicles and are, thus, key components of the DOE's Energy Strategic Goal. The equipment needed to construct, test, and diagnose Li-ion batteries is notoriously complex and must be utilized in a precise manner in order to obtain reliable results. In 2008, LBNL purchased and installed approximately \$750,000 in capital equipment, including a scanning electron microscope, a new glove box, a potentiostat, and other equipment to expand and further enable their electrochemical energy storage cell making, testing, and diagnostics capabilities.

**NOTABLE ACHIEVEMENTS**

- *Building Technologies Program*

*Objective 2.1*

- None

- *Federal Energy Management Program*



*Objective 2.1*

- None
- *Geothermal Technologies Program*

*Objective 2..1*

- None
- *Hydrogen, Fuel Cells and Infrastructure Technologies Program*

*Objective 2..1*

- The experimental and modeling capabilities developed by LBNL are available to companies and other collaborators. Two Advanced Oxidation Process (AOP) projects have been initiated with Los Alamos National Laboratory and 3M in the fuel cell area.
- *Industrial Technologies Program*  
*Objective 2.1*
  - None
- *Vehicle Technologies Program*  
*Objective 2.1*
  - None

**NOTABLE DEFICIENCIES**

- *Building Technologies Program*  
*Objective 2.1*
  - None
- *Federal Energy Management Program*  
*Objective 2.1*
  - None
- *Geothermal Technologies Program*  
*Objective 2.1*
  - None
- *Hydrogen, Fuel Cells and Infrastructure Technologies Program*  
*Objective 2.1*
  - None
- *Industrial Technologies Program Objective 2.1*
  - None
- *Vehicle Technologies Program Objective 2.1*
  - None

**SIGNIFICANT DEFICIENCIES**

- *Building Technologies Program*  
*Objective 2.1*
  - None



- *Federal Energy Management Program*  
*Objective 2.1*
  - None
- *Geothermal Technologies Program*  
*Objective 2.1*
  - None
- *Hydrogen, Fuel Cells and Infrastructure Technologies Program*  
*Objective 2.1*
  - None
- *Industrial Technologies Program Objective*  
*2.1*
  - <sup>1</sup>None
- *Vehicle Technologies Program Objective*  
*2.1*
  - None

#### **SUPPORTING COMMENTS**

- *Building Technologies Program*  
*Objective 2.1*
    - None
  - *Federal Energy Management Program*  
*Objective 2.1*
    - None
  - *Geothermal Technologies Program*  
*Objective 2.1*
    - None
  - *Hydrogen, Fuel Cells and Infrastructure Technologies Program*  
*Objective ,2.1*
    - LBNL has three collaborative projects with 3M and Los Alamos National Laboratory, a project with Toyota, and one with Add-Vision involving membranes for fuel cells.
- s Industrial Technologies Program*  
*Objective 2.1*
  - None
- *Vehicle Technologies Program*  
*Objective 2.1*
    - None



### GOAL 3: EFFECTIVE SCIENCE AND TECHNOLOGY SEARCH PROJECT AND PROGRAM

**MANAGEMENT** with the following objectives:

- Effective program vision and leadership;
- Effective and efficient science and technology project and program planning and management; and
- Effective and efficient communications and responsiveness to EERE PMC needs.

#### SIGNIFICANT ACHIEVEMENTS

- *Building Technologies Program*

##### *Objective 3.1*

- LBNL has excellent vision for the contributions that the next generation of windows will play in achieving zero energy buildings. This has been conveyed to a large array of stakeholders domestically and internationally through white papers, presentations, and other materials. LBNL has also assisted the DOE technology development manager in arranging an executive envelope industry forum to help improve our communication with leading proactive industry partners.

##### *Objective 3.2*

- The LBNL staff adapted their existing knowledge very well to the potential future consequences of standards rulemakings.

##### *Objective 3.3*

- LBNL took a leadership role in conceptualizing, structuring, and launching the Commercial Buildings Initiative, and specifically the National Laboratory Collaborative for Building Technologies.

- *Federal Energy Management Program Objective*

##### *3.1*

- LBNL is recognized as having the greatest technical expertise regarding energy efficiency in laboratories and data centers. LBNL developed and provided SAVEnergy Now in Data Centers workshops for the General Services Administration, the general Federal audience at the GovEnergy conference, and to a predominately private sector engineering audience at the Labs21 conference. As noted in an earlier comment, LBNL was proactive in assuming the lead in developing the study required by EISA section 51 S and in making the initial contacts with and coordinating with the DOD which had co-responsibility for the study.

##### *Objective 3.2*

- LBNL is always timely and thorough in preparation of Annual Operating Plans (AOP) and other work proposals. They are proactive in suggesting tasks and providing detail on required cost and staff resources adequately to inform FEMP when we need to make choices/decisions on resource allocation.

##### *Objective 3.3*

- None

- *Geothermal Technologies Program Objective 3.1*

- LBNL worked with NREL and Sandia National Laboratory to develop a draft GTP 2009-201 S Multiyear Research, Development, and Demonstration Plan with planned program activities to 2025. This visionary plan lays out the technical pathway for the geothermal program to advance EGS technology with an ultimate goal of commercial deployment.
- In addition, LBNL wrote a white paper on the design, creation, analysis, and management of EGS. This white paper provided a brief assessment of the current status of modeling and stimulation for EGS and offered suggestions to DOE for future R&D programs in EGS. Thirteen suggestions for future research activities were presented.
- LBNL has a long history of applying PhD level scientists and engineers to geothermal R&D activities. These scientists and engineers work well with other groups such as the California Geothermal Energy



Collaborative, the Geothermal Resources Council, the U. S. Geological Survey, other national laboratories, and geothermal companies.

*Objective 3.2*

- In fiscal year 2008 LBNL leveraged the GTP's R&D activities with D4E's Office of Science research activities resulting in more effective project management. Many of the geothermal R&D projects are collaborative activities with the geothermal company Ormat that require the acquisition of technical data from the Ormat geothermal development, Desert Peak, in Nevada such as geochemical and geophysical measurements, reservoir tracers, fracture imaging, and seismic surveys.
- As noted under 3.1, LBNL demonstrated planning skills by working with NREL and Sandia National Laboratory to develop a draft GTP 2009-2015 Multiyear Research, Development, and Demonstration Plan with planned program activities to 2025.

*Objective 3.3*

- LBNL is prompt in responding to Headquarters (HQ) requests for information needed for the Corporate Planning System and to needs in general from HQ. The information is always of a high quality. Don DePaolo, Division Director, Earth Science Division of LBNL, met with the Program Manager of the GTP in fiscal year 2008 and discussed programmatic matters including LBNL's desire for LBNL to be a center for EGSs.

- *Hydrogen, Fuel Cells and Infrastructure Technologies Program*

*Objective 3.1*

- Two DOE fuel cell proposals have been submitted with collaborations involving outside laboratories and companies. Several other proposals are pending.

*Objective 3.2*

- LBNL has significant activities in materials for fuel cells, batteries and organic light-emitting devices that use similar materials. Many of the material properties for one device are similar for others. LBNL purchased equipment that can be used for all of the projects exhibiting effective program vision and efficient management by capitalizing on synergies among projects.

*Objective 3.3*

- None

- *Industrial Technologies Program*

*Objective 3.1*

- As noted earlier, LBNL personnel are highly regarded by the data center user community. They are considered the "go to" people by the data center community, especially in California, where they have been leading data center energy efficiency activities for a number of years. They not only have vision, they have also led demonstrations to verify their views of approaches for making data centers more energy efficient.

*Objective 3.2*

- The Field Work Proposal (FWP) submitted by LBNL did an excellent job in describing how they plan to support ITP's Best Practices activities. The FWP laid out not only domestic activities, but also LBNL's generation of strategies to support ITP participation in the Asia Pacific Partnership. However, the FWP was somewhat vague in describing the assistance LBNL would provide in the information communication technology R&D area.

*Objective 3.3*

- LBNL personnel have generally done a very good job of appraising HQ personnel of progress in their activities. Sometimes, however, due to different perspectives, HQ and LBNL may see progress differently, therefore what LBNL views as good progress can be considered to be slow progress at HQ. This occurred during preparations for a workshop to occur later this October.

- *Vehicle Technologies Program*

*Objective 3.1*

- LBNL program management has consistently identified critical research directions and instituted new projects, often involving outside experts and non-LBNL national laboratories, in an effort to pursue



them. They have supported the applied research program being coordinated by Argonne National Laboratory. They have also awarded contracts in the BATT program to 17 non-LBNL researchers out of 25 projects total.

The managers at LBNL also seek out the most qualified principal investigators (PIs) for specific research tasks regardless of their organizational affiliation. In 2008, they initiated five new research projects with PIs outside of the laboratory. Overall, 60 percent of the BATT projects are carried out by non-LBNL entities, commercial organizations, universities, and other national laboratories. In 2008, LBNL hired two new researchers to investigate first principles materials design and novel diagnostics approaches to investigating battery degradation.

#### *Objective 3.2*

- LBNL broadens research into electrolytes and additives for PHEV batteries. LBNL issued a Request for Proposals (RFP) 'Letter of Inquiry' entitled 'Synthesis and Characterization of Novel Electrolytes and Additives for Use in High-Energy Lithium-ion Batteries,' and received forty-three white papers in response. After an initial review, twenty-one of the respondents were asked to submit full proposals in response to the RFP. Seventeen full proposals were received and were reviewed by a panel of sixteen reviewers. BATT management announced the awarding of five new contracts to further their R&D into Lithium-ion battery electrolytes. As part of the BATT program, LBNL oversees and/or directs the research of twentytwo PIs at LBNL, two other national laboratories, seven universities, and one commercial institution. LBNL BATT management has consistently sought out programmatic advice from DOE management, provided guidance and recommendations on new research directions, and has implemented program changes, new projects, and approaches in a timely and accurate manner. Specifically, in 2008 they are initiating five new projects and terminating three projects, based on competitive RFP process in the former case and project evaluations conducted through the merit review process in the latter.
- LBNL meets with DOE management each summer to recommend and discuss new and promising research areas, and is able to implement work in those areas the following fiscal year.

#### *Objective 3.3*

- LBNL staff consistently informs HQ management of major scientific advances, staffing issues, and responds to requests for information on time or ahead of time consistently and accurately. BATT management publishes a comprehensive (sixty page) progress report each quarter that contains updates on all projects under the program's management.
- This progress report provides critical updates to EEREIVTP management, and has served as a model reporting mechanism that is being applied to other programs.

### **NOTABLE ACHIEVEMENTS**

- *Building Technologies Program*

#### *Objective 3.1*

- LBNL staff commits notable effort to supporting activities such as ASHRAE committees and the American Council for an Energy-Efficiency Economy summer study program. The balance between gaining new knowledge through these activities versus jeopardizing project deadlines by over commitment is important.

#### *Objective 3.2*

- LBNL executes the management of its large array of projects in an adequate manner. Major deliverables are completed and planning avoids any significant impacts.

#### *Objective 3.3*

- Communications have improved significantly but reporting is done on an irregular basis. Well documented, timely monthly reporting of progress and issues for EnergyPlus development activities.

- *Federal Energy Management Program*



*Objective 3.1*

- None Objective

*3.2*

- None

*Objective 3.3*

- The quality of work is generally high, but notably in the tasks related to sustainability and power purchases - transitions with staff and a seeming shortage in lab staff created less than optimal timeliness in responses to requests for information: In other areas we have been kept constantly informed of progress and of potential problems related to potential and actual staff losses and funding shortfalls.

- *Geothermal Technologies Program*

*Objective 3.1*

- None

*Objective 3.2*

- None

*Objective 3.3*

- None

- *Hydrogen, Fuel Cells and Infrastructure Technologies Program*

*Objective 3.1*

- None Objective

*3.2*

- None Objective

*3.3*

- None

- *Industrial Technologies Program Objective*

*3.1*

- None

*Objective 3.2*

- None Objective 3.3
- None

- *Vehicle Technologies Program Objective 3.1*

- None

*Objective 3.2*

- None

*Objective 3.3*

- None

**NOTABLE DEFICIENCIES.**

*Building Technologies Program Objective 3..1*

- None Objective 3.2
- None

*Objective 3.3*

- LBNL needs to improve its communications with DOE on activities that are of



interest to EERE's management. LBNL did not submit an adequate number of, weekly highlights. While monthly reports are posted to its web site, the material is often too old for use in weekly reports. Responsiveness is adequate but has decreased in fiscal year 2008.

- *Federal Energy Management Program Objective 3.1*
  - None
- *Objective 3.2*
  - None
- *Objective 3.3*
  - None
- *Geothermal Technologies Program Objective 3.1*
  - None
- *Objective 3.2*
  - None
- *Objective 3.3*
  - None
- *Hydrogen, Fuel Cells and Infrastructure Technologies Program Objective 3.1*
  - Retention of staff is a notable problem as industry seeks to hire staff that has the kinds of qualifications that the LBNL program produces. LBNL has no mechanism to provide career advancement. *Objective 3.2*
  - None *Objective 3.3*
  - None
- *Industrial Technologies Program Objective 3.1*
  - <sup>1</sup>None
- *Objective 3.2*
  - None *Objective 3.3*
  - None
- *Vehicle Technologies Program Objective 3.1*
  - None *Objective 3.2*
  - None *Objective 3.3*
  - None

#### **SIGNIFICANT DEFICIENCIES**

- *Building Technologies Program Objective 3.1*
  - None *Objective 3.2*
  - None *Objective 3.3*
  - None
- *Federal Energy Management Program Objective 3.1*
  - None *Objective 3.2*
  - None *Objective 3.3*
  - None
- *Geothermal Technologies Program Objective 3.1*
  - None *Objective 3.2*





- None Objective 3.3
- None
- *hydrogen, Fuel Cells and Infrastructure Technologies Program*

*Objective 3.1*

- None Objective 3.2
- None Objective 3.3
- None

- *Industrial Technologies Program Objective 3.1*
  - None Objective 3.2
  - None

*Objective 3.3*

- None
- *Vehicle Technologies Program Objective 3.1*

- None

*Objective 3.2*

- None

*Objective 3.3*

- None

**SUPPORTING COMMENTS**

- *Building Technologies Program Objective 3.1*

- None

*Objective 3.2*

- None

*Objective 3.3*

- None

- *Federal Energy Management Program Objective 3.1*

- None

*Objective 3.2*

- None

*Objective 3.3*

- None

- *Geothermal Technologies Program Objective 3.1*

- None

*Objective 3.2*

- None

*Objective 3\*3*

- None

- *Hydrogen, Fuel Cells and Infrastructure Technologies Program Objective 3.1*

- Three post-doctoral fellows have been hired away by industry in the last year which generates a high staff turnover.



*Objective 3.2*

- None *Objective 3.3*
- None

- *Industrial Technologies Program*

*Objective 3.1*

- None *Objective 3.2*
- None *Objective 3.3*
- None

- *Vehicle Technologies Program Objective 3.1*

- None *Objective 3.2*
- None *Objective 3.3*
- None

**GUIDANCE FOR THE NEXT PERFORMANCE PERIOD**

**PERFORMANCE EXPECTATIONS FOR LAWRENCE BERKELEY NATIONAL LABORATORY FOR THE NEXT PERFORMANCE PERIOD** (for example, anticipated accomplishments and level of work, areas of concentration and remedial actions).

- *Building Technologies Program*
  - LBNL staff from the heating products team has been assigned by LBNL management to work on rulemakings for white goods products. This will take closer oversight and supervision to be successful.
  - LBNL should continue its high level of focus on the commercialization of highly insulating windows. Also, as we likely plan for expanded focus in the window area there will be a need to support industry and partners with sophisticated field studies of fully integrated energy efficient systems.
- *Federal Energy Management Program*
  - As detailed in the LBNL AOP and CPS guidance, LBNL must: (1) support TEAM and TEAM Encore to maximize DOE energy management performance and assist replication of TEAM at other agencies; (2) augment Federal Financing Specialists teams' outreach and project development to increase ESPC volume; (3) provide Core Team support to assure agency clients of quality and value received; (4) develop strategic analyses and technical content for new/expanded applications of ESPC; (5) strengthen Federal ESPC guarantees through streamlined, rigorous Measurement and Verification (M&V); (6) support deployment of EERE Technology through ESPCs; (7) support TEAM and TEAM Encore to maximize DOE energy management performance and assist replication of TEAM at other agencies; (8) provide Core Team support to agency clients; (9) complete and implement EISA section 518 study of non-building applications of ESPCs in collaboration with DOD; and (10) assist FEMP in developing guidance for M&V and benchmarking requirements of EISA section 432.
- *Geothermal Technologies Program*
  - LBNL will support EGS field activities at Desert Peak, Nevada using a variety of scientific activities including *fracture imaging using passive* and active seismic, geochemical modeling of reservoir fluids, and fracture detection and flow path detection using 3D resistivity imaging. LBNL also is expected to assist with planning activities and work with field demonstration partners as appropriate.
- *Hydrogen, Fuel Cells and Infrastructure Technologies Program*
  - LBNL is expected to work on developing membrane materials for testing. Hydrogen storage activities should commence at a higher level with timely delivery of funding.
- *Industrial Technologies Program*



- In the information communication technology research and development area, conducted this October. Based on workshop results, LBNL is expected to perform "concept definition studies" on one or more research topics generated in the workshop. These concept definition studies will provide justification for pursuing research in the areas considered.
- *Vehicle Technologies Program*
  - For the next performance period, LBNL should continue to focus the R&D portfolio on high energy materials, especially high voltage cathodes and electrolytes. In addition, LBNL should continue to strengthen their R&D staff in this critical research area.

**INPUT ON CONCERNS FOR LABORATORY MANAGEMENT** (discussion of potential problem areas):

- *Building Technologies Program*
  - LBNL should improve its communications with DOE and responsiveness for issues that are of concern for the Buildings Program and EERE upper management.
- *Federal Energy Management Program*
  - LBNL has, for several years, greatly curtailed its outreach efforts to federal agencies in critical areas including development of ESPC projects, Monitoring and Verification, and Core Team support in general. This has been at the behest of FEMP HQ and as a result of budget constraints and EERE policy shifts. LBNL has significantly reduced its personnel resources devoted to FEMP support. With the renewed emphasis on technology deployment and on making the Federal government the leader -- and DOE the leader within the Federal government in reducing our reliance on fossil fuels, FEMP's role is expected to expand significantly, particularly in the area of alternate financing. We expect that funding will increase to support this role. We would expect LBNL, as they develop their plans and assess their staffing requirements for the next several years, to make decisions that are informed by the current/new policy directions and to provide us with a clear picture of potential staff and other resource deficiencies and requirements for correcting them.
- *Geothermal Technologies Program*
  - LBNL can assist the Office of Geothermal Technologies by playing a more proactive role in implementing EGS activities especially at the EGS field demonstration sites. Teaming with the EGS field site, operator, other national laboratories, and field site performers will help to ensure success at the field sites.
- *Hydrogen, Fuel Cells and Infrastructure Technologies Program*
  - The funding mechanisms are under strain due to Continuing Resolution issues. The Lab needs to work with DOE on reducing funding delays.
- *Industrial Technologies Program*
  - In addition to the comment noted under objective 3.3, a potential problem can arise as a result of the R&D workshop to be held later this month. A number of research area topics are expected to be generated. Some of these will form the basis for concept definition studies. Some of these topics may be outside of the areas of competence of the LBNL team supporting ITP in this area, and no other individuals with the needed competence may be available at LBNL to conduct the concept definition study.
- *Vehicle Technologies Program*
  - No potential problems have been identified at this time.



OFFICE OF CIVILIAN RADIOACTIVE WASTE MANAGEMENT  
FY 2008 EVALUATION  
Lawrence Berkeley National Laboratory

1.0 Provide for Efficient and Effective Mission Accomplishment (Quality, Productivity, Leadership, & Timeliness of Research and Development)

The Contractor produces high-quality, original, and creative results that advance science and technology; demonstrates sustained scientific progress and impact; receives appropriate external recognition of accomplishments; and contributes to overall research and development goals of the Department and its customers.

The Provide for Efficient and Effective Mission Accomplishment Goal measured the overall effectiveness and performance of the Contractor in delivering science and technology (S&T) results which contributed to and enhanced the Department of Energy's (DOE) mission of protecting our national and economic security by providing world-class scientific research capacity and advancing scientific knowledge by supporting world-class, peer-reviewed scientific results, which were recognized by others.

1.1 Science and Technology Results Provide Meaningful Impact on the Field

Grade: A      Score: 3.9

For over the last twenty years, the Lawrence Berkeley National Laboratory's (LBNL) Earth Sciences Division has significantly contributed to and taken the lead in many aspects of the site characterization and performance assessment efforts of Yucca Mountain for the Office of Civilian Radioactive Waste Management (OCRWM). LBNL's research has been focused on the 600-m-thick unsaturated zone. Prior to the Yucca Mountain studies, most published research in unsaturated zone was confined to near-surface flow and transport processes in relation to the soil vadose zone.

LBNL's studies at Yucca Mountain-published widely in peer-reviewed journals: including two special issues of *Journal of Contaminant Hydrology*-have greatly advanced the knowledge of flow and transport in thick, fractured, unsaturated rocks, and brought LBNL the recognition in the scientific research community as the leader in fundamental understanding, testing, analysis, and modeling of unsaturated flow and transport in fractured porous media, including the study of complex thermally driven hydrological, chemical, and mechanical coupled processes. Within OCRWM, LBNL's scientific contribution to the waste disposal program is highly valued, and LBNL's scientific judgment is trusted. LBNL has frequently been selected to represent OCRWM on external oversight panels and review boards.

During the 2008 performance period, LBNL staff have participated in development of the technical bases for projecting long term (>10,000 years) performance of a geologic repository for spent nuclear fuel and high-level radioactive waste. LBNL staff are primary authors of reports on Unsaturated Zone Flow and Transport reports that are referenced in the repository license application. The technical work has been timely, accurate, and of high quality.

LBNL also provides expertise in the area of the near-field environment with three Analysis Model Reports (AMR): (1) Drift Scale Thermal, Hydrological, and Chemical (THC) Seepage Model, (2) THC Sensitivity Study of Heterogeneous Permeability and Capillarity Effects, and (3) Abstraction of Drift Seepage. The content of the Drift Scale THC Seepage Model is truly state-of-the-art, incorporating realistic THC processes, and coupled to multiphase transport.

The support of LBNL staff as authors for responsible portions of the Yucca Mountain license application was exemplary and integral to that effort. The staff support in meetings and input to correspondence with the repository regulator, the U.S. Nuclear Regulatory Commission (NRC), was of the highest quality.

Support provided by LBNL in the science component of the Yucca Mountain Repository Development Program has been outstanding. Despite a major reduction in FY 2008 funding and a significant reduction of staff performing OCRWM work. LBNL's research constitutes many aspects of the technical basis crucial to the successful license application for the repository, which was submitted to NRC on June 3, 2008.

- Developed and completed two major high-quality sections of the Safety Analysis Report (SAR) for the license application, covering the important natural-barrier areas of unsaturated zone flow and seepage into drifts, respectively.
- Completed a high-quality Analysis Report on UZ Flow Models and Sub models, which included calibration of infiltration rates at Yucca Mountain to temperature and chloride data measured in the unsaturated zone. This work supports earlier analyses about infiltration rates at Yucca Mountain.
- Provided input and leadership in preparation of the upcoming license defense phase, and has several key staff expected to be instrumental in defending license application science related to UZ flow and



transport, seepage, and coupled processes.

LBNL has performed all elements of the above work in an outstanding manner, in full compliance with Yucca Mountain quality assurance procedures. LBNL has passed all quality assurance audits and surveillances where the quality of the LBNL program and the high professionalism and knowledge of the technical and quality assurance staff were commended.

#### 1.2 Provide Quality Leadership in Science and Technology

Grade: A Score: 3.8

LBNL is responsible for key areas regarding the ability of the unsaturated zone at Yucca Mountain to function as a natural barrier to radionuclide transport. LBNL staff members are key experts in UZ flow and transport, seepage, and coupled processes. LBNL-led projects in the S&T program are pursuing innovative solutions to high-level waste isolation. Along with field, laboratory, and modeling studies on transport parameters and retardation processes, these studies are providing a strong scientific basis for the capability of Yucca Mountain to effectively isolate radionuclides from the accessible environment.

LBNL continued leadership and participation in DECOV ALEX, an international collaboration of scientists investigating the impacts of coupled processes on a potential nuclear waste repository. LBNL is clearly the leader in the understanding and modeling of both the THC and thermal, hydrological, and mechanical coupled processes.

#### 1.3 Provide and Sustain Science and Technology Outputs that Advance Program Objectives and Goals

Grade: A

LBNL supported the OCRWM program in successfully submitting the license application in June 2008. LBNL will sustain defense of the application and receipt of a construction authorization to begin repository operations at the earliest projected date of 2020. The work performed by LBNL is a key part of that work. The LBNL investigators working on the OCRWM program have done an outstanding job in completing the work necessary to achieve the program goals.

Also in FY 2008, LBNL:

- Completed screening and justification for various features, events, and processes (PEP)
- Participated in various review and checking activities regarding important license application documents
- Submitted and published 24 peer-reviewed papers supported by OCRWM. LBNL has three papers in the recent Special Issue on "High-Level Radioactive Waste Management" in *Nuclear Technology*. One LBNL scientist organized as a guest editor a Special Issue on "Recent Advances in Nuclear Waste Isolation" in *Nuclear Technology* to be published soon.

#### 1.4 Provide for Effective Delivery of Science and Technology

Grade: A

LBNL met all milestones for providing SAR sections, AMRs, PEP justifications, as well as other supporting documents. LBNL continued and finalized several key research studies in the OCRWM S&T program, including, for example, state-of-the-art modeling of the THC environment in the waste emplacement drift, evaluation of the natural analogue at Pena Blanca, drift-shadow field experiments in the Black Diamond Mine, and evaluation of the potential for in-drift convection to reduce seepage.

- LBNL did an outstanding job contributing to the preparation of a high-quality license application to construct the first U.S. high-level radioactive waste geological repository.
- LBNL did an excellent job in reviewing and providing key comments and resolving them timely for preparation of the Total System Performance Assessment (TSPA) LA Validation volume (Volume II of the TSPA) as a lead lab contractor.
- LBNL provided prompt and excellent support to evaluation of the LBNL copyright application for the flow and transport code THOUGHREACT version 3.
- LBNL supported abstractions of the relevant process models (unsaturated zone flow and transport and THC) for the TSPA-LA.



## 2.0 Provide Effective and Efficient Science and Technology Research Project/Program Management

The Contractor provides effective program vision and leadership; strategic planning and development of initiatives; recruits and retains a quality scientific workforce; and provides outstanding research processes, which improve research productivity.

The goal measured the Contractor's overall leadership in executing S&T programs. Dimensions of program management covered included: (1) providing key competencies to support research programs to include key staffing requirements; (2) providing quality research plans that take into account technical risks and identifying actions to mitigate risks; and 3) (maintaining effective communications with customers to include providing quality responses to customer needs.

LBLN leadership and vision advanced the goals of submitting a high-quality license application, and its effective communications with DOE and other agencies were responsive and supportive.

## 3.0 Provide Effective and Efficient Science and Technology Research Project/Program Management

The Contractor provides effective program vision and leadership; strategic planning and development of initiatives; recruits and retains a quality scientific workforce; and provides outstanding research processes, which improve research productivity.

### 3.1 Provide Effective and Efficient Stewardship of Scientific Capabilities and Program Vision

Grade: A Score: 3.8

As the OCRWM baseline program has advanced from site characterization to development of a license application, LBNL management has worked effectively to retain staff capability to support defense of the scientific technical bases during the hearing process. LBNL management has also contributed to the identification and development of long-term testing and performance confirmation activities.

LBLN provided leadership and vision to the Program regarding science advances in several key areas related to the ability of the unsaturated zone at Yucca Mountain to function as a natural barrier to radionuclide transport.

### 3.2 Provide Effective and Efficient Science and Technology Project/Program Planning and Management

Grade: A Score: 3.8

LBLN worked closely with DOE and the lead laboratory for project/program planning and management, providing timely input to work scope planning, budgeting, staff allocation, schedules, etc. In spite of significant budget reductions in FY 2008, the productivity in LBNL's projects and assignments was excellent.

### 3.3 Provide Efficient and Effective Communications and Responsiveness to Customer Needs

Grade: A Score: 3.9

LBLN was always responsive to customer requests for information. The responses were thorough and correct and provided in a timely manner, and communication channels to DOE and lead laboratory management were excellent. At the request of DOE, LBNL worked with oversight organizations such as the NRC and the Nuclear Waste Technical Review Board. Customer requests for information elicited thorough, correct, and timely responses. LBNL authored two major SAR sections of the license application, finalized one document in the suite of AMRs, forming the scientific basis for the license application, and developed various PEP screening justifications. Together, these document the state-of-the-art understanding of key issues regarding the ability of the unsaturated zone at Yucca Mountain to function as a natural barrier to radionuclide transport. LBNL staff members are also investigators in ten research projects within the OCRWM S&T program.

The LBNL investigators working on the OCRWM Program provided efficient and effective communications by attending several meetings with current and new OCRWM employees and delivering outstanding briefings.

Continued participation by LBNL to defend the license application before the NRC and the Atomic Safety Licensing Board hearings will be essential to the overall success of the OCRWM Program.





**Department of Energy**  
Washington, DC 20585

November 20, 2008

**MEMORANDUM**

**TO:** Joseph Krupa  
Institutional Program Manager Berkeley Site Office

**FROM:** James A. Slutz  
Assistant Secretary (Acting) Office of Fossil Energy

**SUBJECT:** Department of Energy (DOE) Evaluation of Science and Technology Programs at the University of California Lawrence Berkeley National Laboratory for FY 2008.

Attached are the reviews obtained from Office of Fossil Energy project managers regarding evaluation of Science and Technology Programs at the University of California Lawrence Berkeley National Laboratory for FY 2008. These reviews represent work actively being performed for and funded by the Office of Fossil Energy during this period. In soliciting input for this review, the only performance evaluations that were requested were for R&D-type projects, and, of those, only the ones that were valued at \$ 100,000 or more in FY08. The individual evaluations that were received are attached and account for projects totaling over \$7.0 million.

No attempt was made to screen, blend or summarize any reviewer comments; they represent the verbatim remarks that were submitted by each contributor. Should you need any further information, please contact William Fernald at 301-903-9448 ([william..Fernald@hq.doe.gov](mailto:william..Fernald@hq.doe.gov)).

Attachments



## **Laboratory Year-End Performance Assessment Report**

Date: 11/061/2008

Headquarters Program Office Fiscal Year 2008 Evaluation of Science and Technology Program Performance at the Lawrence Berkeley National Laboratory

Agency: U.S. Department of Energy

Program Office: Assistant Secretary for Fossil Energy FY Funding Level: (Budget Authority) S300,000

### **Coal 1.0 Provide for Efficient and Effective Mission Accomplishment**

Goal Score: 3.75 Goal Grade: A

#### **Goal 1.0**

**Performance Summary Statement:** Excellent progress made in fulfilling the objectives

outlined in the FWP

#### **Objective 1.1 Science and Technology Results Provide Meaningful Impact on the field**

Score: 3.8 Grade: A Weighting: 25

##### **Objective 1.1 Performance Summary Statement:**

Gave several high-quality presentations and made data available to the research entities and Utilities in India

#### **Objective 1.2 Provide Quality Leadership in Science and Technology**

Score: 3.9 Grade: A Weighting: 25

##### **Objective 1.2 Performance Summary Statement:**

Established excellent collaborative efforts with state Electricity Board in India as well as leading Power sector players

#### **Objective 1.3 Provide and Sustain Science and Technology Outputs that Advance Program Objectives and Goals**

Score: 3.9 Grade: A Weighting: 25

##### **Objective 1.3 Performance Summary Statement:**

Prepared and signed MOUs with key participants from both India and the U.S.

#### **Objective 1.4 Provide for Effective Delivery of Science and Technology**

Score: 3.9 Grade: A Weighting: 25 **Objective 1.4**

##### **Performance Summary Statement:**





Excellent response to requests from DOE to provide status updates Via both presentations and discussions.

**Goal 2.0 Provide for Efficient and Effective Design, Fabrication, Construction and Operation of Research Facilities** *(Not applicable to FE)*

**Goal 3.0 Provide Effective and Efficient Science and Technology Program Management** Goal Score: 3.90

Goal Grade: A

**Goal 3.0 Performance Summary Statement:**

Facilitated signing of MOUs and shared information through multiple workshops

**Objective 3.1 Provide Effective and Efficient Stewardship of Scientific Capabilities and Program Vision**

Score: 3.80

Grade: A

Weighting: 40

**Objective 3.1 Performance Summary Statement:**

Organized well-attended workshops on demand response which included hands-on responses

**Objective 3.2 Provide Effective and Efficient Science and Technology Project/Program Planning and Management**

Score: 4.0

Grade: A

Weighting: 30

**Objective 3.2 Performance Summary Statement:**

Excellent scoping and training programs, and consultation with heads of four utility companies in Mumbai, India, leading to large budget for this activity by the Indian players

**Objective 3.3 Provide Efficient and Effective Communications and Responsiveness to Customer Needs**

Score: 4.0

Grade: A

Weighting: 30

**3.3 Performance Summary Statement:**

Excellent response to customers in terms of providing critical information to move the project along.

**Laboratory Year-End Performance Assessment Report**

Date: 31 October 2008

Headquarters Program Office Fiscal Year 2008 Evaluation of Science and Technology Program Performance at the Lawrence Berkeley National Laboratory

Agency: U.S. Department of Energy



Program Office: Assistant Secretary for Fossil Energy FY

Funding Level: (Budget Authority) \$515,000

**Goal 1.0 Provide for Efficient and Effective Mission Accomplishment** Goal Score:

3.7 Goal Grade: A

**Goal 1.0 Performance Summary Statement:**

See below

**Objective 1.1 Science and Technology Results Provide Meaningful Impact on the Field** Score: 3.7 Grade:

A- Weighting: 25

**Objective 1.1 Performance Summary Statement:**

This project in my opinion has changed the way that OEM's think about the type Of turbine combustion that is relevant to DOE FE goals.

**Objective 1.2 Provide Quality Leadership in Science and Technology**

Score: 3.6 Grade: A- Weighting: 25 **Objective 1.2**

**Performance Summary Statement:**

**Objective 1.3 Provide and Sustain Science and Technology Outputs that Advance Program Objectives and Goals**

Score: 3.8 Grade: A Weighting: 25

**Objective 1.3 Performance Summary Statement:**

Project remains in the required presentation venues (i.e. ASME)

**Objective 1.4 Provide for Effective Delivery of Science and Technology**

Score: 3.8 Grade: A Weighting: 25 **Objective 1.4**

**Performance Summary Statement:**

Project needs to remain focused on development of required computational tools.

**Goal 2.0 Provide for Efficient and Effective Design, Fabrication, Construction and Operation of Research Facilities** (Not applicable to FE,)



### **Coal 3.0 Provide Effective and Efficient Science and Technology Program Management**

Goal Score: 3.15

Goal Grade: B-+

#### **Goal 3.0 Performance Summary Statement:**

#### **Objective 3.1 Provide Effective and Efficient Stewardship of Scientific Capabilities and Program Vision**

Score: 3.0

Grade: B

Weighting: 40 **Objective**

#### **3.1 Performance Summary Statement:**

It is not easy, but the group needs to maintain a strong dialogue with DOE Headquarters in forecasting costs and timetables associated with technology scale up.

#### **Objective 3.2 Provide Effective and Efficient Science and Technology Project/Program Planning and Management**

Score: 3-1

Grade: B+

Weighting: 30 **Objective 3.2**

#### **Performance Summary Statement:**

It is hoped that the team will streamline the process for development and use of the computational tools required by the project.

#### **Objective 3.3 Provide Efficient and Effective Communications and Responsiveness to Customer Needs**

Score: 3.4

Grade: B+

Weighting: 30 **Objective 3.3**

#### **Performance Summary Statement:**

The team is always available to answer questions,

### **Laboratory Year-End Performance Assessment Report**

Date:

Headquarters Program Office Fiscal Year 2008 Evaluation of Science and Technology Program Performance at the Lawrence Berkeley National Laboratory

Agency: U.S. Department of Energy



program Office: Assistant Secretary for Fossil Energy FY Funding

Level: (Budget Authority) \$330,000

**Goal 1.0 Provide for Efficient and Effective Mission Accomplishment** Goal Score: A-

Goal Grade: 3.6

**Goal 1.0 Performance Summary Statement:**

The project team is very well utilized to perform the research work with significant expertise in measuring hydrate formation/decomposition processes, particularly using CT X-ray analysis. Coupling of these high quality measurements with the simulations being performed by George Moridis et al. at LBNL presents a very powerful method of assessing hydrate structure.

*Note:- George Moridis is listed as PI and Tim Kneafsey as co-PI. Tim actually is the principal researcher on this FWP*

**Objective 1.1 Science and Technology Results Provide Meaningful Impact on the Field**

Score: A-

Grade: 3.7

Weighting: 25 **Objective 1.1 Performance**

**Summary Statement:**

Kneafsey and his team have published a significant number of quality papers in conference proceedings and peer-reviewed journals. Their work has also been presented at several meetings, drawing a lot of interest in their work. Peer review is significantly positive of this work and its continuation.

**Objective 1.2 Provide Quality Leadership in Science and Technology**

Score: A-

Grade: 3.7

Weighting: 25 **Objective**

**1.2 Performance Summary Statement:**

Tim Kneafsey has presented his team's work at many, if not all, the principal US and international hydrate conferences. He has been involved in the analysis of sediment cores from nearly every hydrate program field excursion. This group is very visible in the hydrates community and is a national and international leader in the field of laboratory hydrate experiments.

**Objective 1.3 Provide and Sustain Science and Technology Outputs that Advance Program**

**Objectives and Goals**

Score: 13+

Grade: 3.4

Weighting: 25

**Objective 1.3 Performance Summary Statement:**

There are several aspects of this project that are state-of-the-art, including the CT-imaging, the use of inverse hydrate modeling to predict relative permeability results, and the experimental designs for geomechanical properties. The synthesis method for gas hydrate/sediment samples from dissolved gas is state-of-the-art and it is important to pursue the method so that samples more closely represent the samples found in nature, especially for the geomechanical measurements.



**Objective 1.4 Provide for Effective Delivery of Science and Technology** Score: 13+ Grade:

3.4 Weighting: 25 **Objective 1.4 Performance Summary Statement:**

The project team is making steady progress towards all stated objectives. Milestones are being met generally on time and in instances where there are delays, the team is responsive to providing information and justification of delays in a timely manner. The team has shown exceptional flexibility to the needs of the program by taking on critical, timely analyses over and above initially planned scope.

**Goal 2.0 Provide for Efficient and Effective Design, Fabrication, Construction and Operation of Research Facilities** (Not applicable to FE)

**Goal 3.0 Provide Effective and Efficient Science and Technology Program Management**

Goal Score: A- Goal Grade: 3.5

**Goal 3.0 Performance Summary Statement:**

Estimations of the parameters for relative permeability saturation and capillary pressure saturation from experiment and inverse modeling is unique to this group and will provide important data in assessing the feasibility of hydrate production from various systems and for improving the accuracy of the reservoir simulation models, two key goals of the hydrate program. Laboratory measurements of geomechanical behavior of synthetic hydrate bearing cores is also of significance to the overall goals of this program and will provide important information to support production of gas from hydrate deposits and for more general well-bore stability issues.

**Objective 3.1 Provide Effective and Efficient Stewardship of Scientific Capabilities and Program Vision**

Score: E3 ~ Grade: 3.4 Weighting: 40

**Objective 3.1 Performance Summary Statement:**

Tim Kneafsey participated in a recent workshop of leading scientists and researchers involved in studying gas hydrate sediments. The results of this workshop will be submitted for peer review and are destined to be the foundational roadmap for future research related to the physical properties of hydrate bearing sediments.

**Objective 3.2 Provide Effective and Efficient Science and Technology Project/Program Planning and Management**

Score: B Grade: 3.0 Weighting: 30 **Objective**

**3.2 Performance Summary Statement:**

As previously noted, the LBNL facilities and scientific approach are state-of-the-art. And also as noted, the coupling of this team's work with the simulation work being performed by Moridis is extremely critical to the program goals and objectives, and presents a very powerful method of assessing hydrate structure.

**Objective 3.3 Provide Efficient and Effective Communications and Responsiveness to Customer Needs**

Score: A Grade: 4.0 Weighting: 30

**Objective 3.3 Performance Summary Statement:**



The project team provides timely and detailed progress reports. Milestones are generally met on time and when they are not, the team provides good documentation as to why. For example, sonic tests were not allowed to progress in a timely fashion as was hoped due to safety regulations at the lab and until the tests of newly designed pressure vessels had been conducted by the engineering division at LBNL. The team is very responsive to ad hoc requests from the program office.

### Laboratory Year-End Performance Assessment Report

Date: 10/29/2008

Headquarters Program Office Fiscal Year 2008 Evaluation of Science and Technology Program Performance at the Lawrence Berkeley National Laboratory

Agency: U.S. Department of Energy

Program Office: Assistant Secretary for Fossil Energy FY Funding Level: (Budget Authority) \$300,000

#### Coal 1.0 Provide for Efficient and Effective Mission Accomplishment

Goal Score: 4.1

Goal Grade: A+

##### Goal 1.0 Performance Summary Statement:

The project is on target to develop models addressing CO<sub>2</sub> geologic storage. The work to date is excellent with numerous publications completed or under development. The LBNL researchers are pursuing the necessary collaboration to apply the modeling work to ongoing geologic storage projects.

##### Objective 1.1 Science and Technology Results Provide Meaningful Impact on the Field

Score: 4.1

Grade: A+

Weighting: 25 **Objective 1.1 Performance**

##### Summary Statement:

The project is on target in developing models addressing CO<sub>2</sub> geologic storage. The work to date is excellent with numerous publications completed or under development.

##### Objective 1.2 Provide Quality Leadership in Science and Technology

Score: 4.1

Grade: A+

Weighting: 25 **Objective**

##### 1.2 Performance Summary Statement:

The project addresses gaps in ongoing modeling efforts. The researchers have pursued collaboration with researchers (DOE Regional Partnerships).

##### Objective 1.3 Provide and Sustain Science and Technology Outputs that Advance Program Objectives and Goals

Score: 4.1

Grade: A+

Weighting: 25 **Objective**

##### 1.3 Performance Summary Statement:



The project is on schedule and research has produced results.

**Objective 1.4 Provide for Effective Delivery of Science and Technology**

Score: 4.1

Grade: A+

Weighting: 25 **Objective 1.4**

**Performance Summary Statement:**

The LBNL researchers have met the project goals and milestones and have consistently met deliverable schedules. The researchers are very effective in transmitting results and are responsive to the geologic storage community.

**Goal 2.0 Provide for Efficient and Effective Design, Fabrication, Construction and Operation of Research Facilities** *(Not applicable to FE)*

**Goal 3.0 Provide Effective and Efficient Science and Technology Program Management**

Goal Score: 4.1

Goal Grade: A+

**Goal 3.0 Performance Summary Statement:**

In the reviewers opinion - the researchers are excellent!

**Objective 3.1 Provide Effective and Efficient Stewardship of Scientific Capabilities and Program Vision**

Score: 4.1

Grade: A+

Weighting: 40 **Objective**

**3.1 Performance Summary Statement:**

The project was well thought out and timely. The researchers are collaborating with the regional Partnerships.

**Objective 3.2 Provide Effective and Efficient Science and Technology Project/Program Planning and Management**

Score:

Grade:

Weighting: 30 **Objective**

**3.2 Performance Summary Statement:** The reviewer is not qualified to comment.

**Objective 3.3 Provide Efficient and Effective Communications and Responsiveness to Customer Needs**

Score: 4.1

Grade: A+

Weighting: 30 **Objective**

**3.3 Performance Summary Statement:**



The researchers have always responded to requests for information. The researchers provide timely results (i.e. through deliverables).

### Laboratory Year-End Performance Assessment Report

Date: 10/29/2008

Headquarters Program Office Fiscal Year 2008 Evaluation of Science and Technology Program Performance at the Lawrence Berkeley National Laboratory: FWP LBL-S-LSD07-O11, (CO<sub>2</sub>SINK

Agency: U.S. Department of Energy

Program Office: Assistant Secretary for Fossil Energy

FY Funding Level: (Budget Authority) \$250,000; B&R 3010000

#### Goal 1.0 Provide for Efficient and Effective Mission Accomplishment

Goal Score: 4.0

Goal Grade: A **Goal 1.0 Performance Summary**

#### Statement:

This year, LBNL has continued to produce high-quality, original, and creative results that advance science and technology; demonstrated sustained scientific progress and impact; received high external recognition of accomplishments; and have made step-change contributions to research and development goals of the Department and its customers. The following achievements are provided as support.

LBNL researchers are supporting an international team and world-class geoscience organization in Germany (GeoForschungsZentrum (GFZ) Potsdam) that is investigating carbon dioxide storage processes and monitoring through the CO<sub>2</sub>SINK project, onshore Europe. The CO<sub>2</sub>SINK Collaboration provides highly cost-leveraged participation in a mid-scale CO<sub>2</sub> sequestration demonstration in Ketzin, Germany, that is also recognized by Carbon Sequestration Leadership Forum (CSLF). CO<sub>2</sub>SINK's primary objective is to provide the scientific underpinnings for and build public confidence in geosequestration through intensive monitoring and verification of CO<sub>2</sub> plume emplacement in a saline formation beneath a stratigraphic trap. The CSLF is a major international initiative for DOE, and LBNL is providing step-change contributions leading to the success of this CSLF-endorsed project. Berkeley Laboratory has two specific tasks: (1) conducting Distributed Thermal Perturbation Sensor (DTPS) design, fabrication, deployment, measurements and analyses of these data, and (2) performing laboratory measurements of seismic properties as a function of variable CO<sub>2</sub> saturation to facilitate accurate interpretation of field seismic data.

The science and technology results of the researchers have provided high and meaningful impact on the field. The researchers are contributing to DOE's Carbon Sequestration Program that supports the Global Climate Change Initiative by conducting studies that focus on the Greenhouse Gas (GHG) mitigation technology of geologic storage of carbon dioxide (CO<sub>2</sub>). This effort is a Presidential Initiative.

The impact on DOE and its mission for GHG mitigation has been enormous because LBNL researchers are developing a new tool and methodology to monitor geologic storage, and successfully deploy it in the field. They are also representing the U.S. and DOE's science expertise in the above-named international project, and are fully engaged with international colleagues on the design, field testing, and analyses of results.

The researchers are highly successful stewards in the research for geologic storage of carbon dioxide. Their work supporting the design and field deployment of the DTPS at the CO<sub>2</sub>SINK *Field* site is a supportive example. It is the first-ever use of this DTPS tool to monitor injected CO<sub>2</sub>. In addition, the lab measurements to acquire seismic properties under CO<sub>2</sub> conditions using core from the Ketzin site will aid in seismic field interpretations, and likely





advance knowledge in the widely used seismic survey technique for monitoring injected CO<sub>2</sub>. In addition, they are moving the research area forward and are resolving critical questions such as "can thermal-based measurements monitor the CO<sub>2</sub> plume and what are the cost benefits of this tool over other techniques?"

The results of their research have generated interest/enthusiasm in the Field; the request for their continued participation in this world-class international project, CO<sub>2</sub>SINK, is a supportive achievement. The CO<sub>2</sub>SINK project has now also shared valuable core with LBNL, from the study area to enable LBNL to complete laboratory measurements. Endorsed by the CSLF, the project is also funded by the European Commission.

Additional details of achievements are elaborated on in 1.1, 1.2, and 1.3.

### **Objective 1.1 Science and Technology Results Provide Meaningful Impact on the Field**

Score: 4.0

Grade: A

Weighting: 25

#### **Objective 1.1 Performance Summary Statement:**

The science and technology results of the researchers have provided high and meaningful impact on the field. The following achievements are noted as support.

- LBNL researchers are supporting an international team and world-class geoscience organization in Germany and Europe (GeoForschungsZentrum Potsdam) that is investigating carbon dioxide storage processes and monitoring through the CO<sub>2</sub>SINK project, onshore Europe. The CO<sub>2</sub>SINK Collaboration provides highly cost-leveraged participation in a mid-scale CO<sub>2</sub> sequestration demonstration in Ketzin, Germany, that is also recognized by Carbon Sequestration Leadership Forum (CSLF). CO<sub>2</sub>SINK's primary objective is to provide the scientific underpinnings for and build public confidence in geosequestration through intensive monitoring and verification of CO<sub>2</sub> plume emplacement in a saline formation beneath a stratigraphic trap. The CSLF is a major international initiative for DOE, and LBNL is providing step-change contributions leading to the success of this CSLF-endorsed project. Berkeley Laboratory has two specific tasks: (1) conducting Distributed Thermal Perturbation Sensor (DTPS) design, fabrication, deployment, measurements and analyses of these data, and (2) performing laboratory measurements of seismic properties as a function of variable CO<sub>2</sub> saturation to facilitate accurate interpretation of field seismic data. Highlights of this year's efforts included the field deployment of the DTPS in two observation wells at the test site, baseline data acquisition, and monitoring injection that commenced in July.
- The researchers are contributing to DOE's Carbon Sequestration Program that supports the Global Climate Change initiative by conducting studies that focus on the Greenhouse Gas (GHG) mitigation technology of geologic storage of carbon dioxide. This effort is a Presidential Initiative. In this project, LBNL leverages Scientific understanding and technology development for this highly visible ongoing world-class geologic CO<sub>2</sub> storage project (Carbon Sequestration Leadership Forum (CSLF)-recognized through leadership and collaboration in the scientific and engineering objectives. The CSLF is also an important initiative for DOE, and LBNL is providing step-change contributions leading to the Success of these CSLF-endorsed projects.
- The impact on DOE and its mission for GHG mitigation is great because LBNL researchers are developing new tools and methodologies for geologic storage, and successfully applying them in the field. They are also representing the U.S. and DOE's science expertise in the above-named international projects, and are fully engaged with international colleagues on the design, field testing, and analyses of results.
- The researchers are highly successful stewards in the research for geologic storage of carbon dioxide. This is exemplified by their work on the design and fabrication, field deployment, and data acquisition for the DTPS. The development of this tool and technique may become more widely-used in the scientific community due to its effectiveness in monitoring a CO<sub>2</sub> plume and cost-savings. In addition, they are moving the research area forward and are resolving critical questions such as "can thermal-based measurements monitor the CO<sub>2</sub> plume



and what are the cost benefits or this tool over other techniques?"

- This research has generated great interest/enthusiasm; the request for their participation in this international project is just one supportive achievement.
- LBNL excels in making high-quality data available to the scientific community. This achievement is supported by publications and presentations; several are noted in the following:
  - a. Henningses, J., Freifeld, B., Cunow, C., Schrotter, Poser, M., 2008, Permanent Downhole Monitoring (WP 6.4): First Results of Distributed Temperature Sensing, presented at the C02SiNK 10th Project Meeting, Potsdam, March 3, 2008.
  - b. Freifeld, B., 2007, Monitoring CO<sub>2</sub> Geosequestration Using Distributed Thermal measurements, presented at DOE/NETL Sixth Annual Conference on Carbon Capture and Sequestration, Pittsburgh, Pennsylvania, May 7-10, 2007.

### **Objective 1.2 Provide Quality Leadership in Science and Technology**

Score: 4.0

Grade: A

Weighting: 25 **Objective 1.2**

#### **Performance Summary Statement:**

The researchers have provided high quality leadership in science and technology. Research results have had high and meaningful impact on the field. The following achievements are provided as support.

The LBNL scientific research pursued is unique and a challenge with respect to monitoring geologic storage as a GHG mitigation technology. The lab is a trendsetter in the field with respect to the scientific approach and application of a thermal-based monitoring system. They are in a leadership role in this specialized study and their excellence is demonstrated in numerous ways described in 1.1, including the Following:

LBNL researchers are supporting an international team and world class geoscience organization in Germany (GeoForschungsZentrum Potsdam) that is Investigating carbon dioxide storage processes and mechanisms through the CO<sub>2</sub>SINK project, onshore Europe. The CO<sub>2</sub>SINK Collaboration provides highly cost-leveraged participation in a mid-scale CO<sub>2</sub> sequestration demonstration project in Ketzin, Germany that is also recognized by Carbon Sequestration Leadership Forum (CSLF). Berkeley Laboratory has two specific tasks: (1 ) conducting Distributed Thermal Perturbation Sensor (DTPS) design, fabrication, deployment, measurements and analyses of these data, and (2) performing laboratory measurements of seismic properties as a function of variable CO<sub>2</sub> saturation to facilitate accurate interpretation of field seismic data.

As supported above and in 1.1, LBNL has achieved the following.

- LBNL researchers have pursued novel approaches and demonstrated innovative solutions to problems,
- LBNL researchers have addressed high-risk/high payoff/long-term research problems.
- Their approaches to science addressing geologic storage are unique and a challenge.
- LBNL is recognized for doing the best work in the field.
- LBNL researchers have collaborated extensively with both U.S. and international colleagues working on geologic storage of carbon dioxide.
- LBNL staff members are visible in leadership positions in the scientific community.



- LBNL have been very effective in driving the direction and setting the priorities of the research community.
- LBNL is a trendsetter in the field.

**Objective 1.3 Provide and Sustain Science and Technology Outputs that Advance Program Objectives and Goals**

Score: 4.0

Grade: .A

Weighting: 25 **Objective**

**1.3 Performance Summary Statement:**

This research provides and sustains science and technology outputs that advance program objectives and goals. This is supported by:

- Presentations and publications. (see list provided in 1.1).
- Demonstrated progress according to peer reviewed recommendations. As part of the C02SiNK project team, they have collaborated extensively with their peer researchers on the design, fabrication, deployment, data acquisition, and analyses of the DTSP system.

**Objective 1.4 Provide for Effective Delivery of Science and Technology**

Score: 4.0

Grade: A

Weighting: 25 **Objective 1.4**

**Performance Summary Statement:**

The researchers have been very effective and efficient in the delivery of the science. This has been demonstrated by the following achievements.

- Effective in meeting goals and milestones such as the FY08 FWP quarterly project milestones that are reported on by the program.
- Effective in FY08 FWP reporting and providing necessary DOE documents for strategic planning. Effective in delivering on promises; LBNL researchers have showcased U.S. and DOE scientific expertise in this international C02SiNK project that is a GSI,F-endorsed project funded by the European Commission.
- Effectively transmitting results to the scientific community as supported by extensive collaboration with peer-researchers in carbon sequestration (see 1.1).

**Goal 2.0 Provide for Efficient and Effective Design, Fabrication, Construction and Operation of Research Facilities** *(Not applicable to FF.)*

**Goal 3.0 Provide Effective and Efficient Science and Technology Program Management**

Goal Score: 4.0

Goal Grade: A

**Goal 3.0 Performance Summary Statement:**



LBNL provides highly effective program vision and leadership; strategic planning and development of initiatives; and retains a high quality scientific workforce. The researchers provide a high degree of effective and efficient science and technology research project/program management. This is demonstrated by achievements in the following.

Highly efficient and effective joint planning with the outside scientific community is demonstrated by their participation in the CSLF-endorsed C02SINK project in Germany that is funded by the European Commission.

The researchers have articulated scientific vision well with respect to their specialty of development and application of monitoring tools for geologic storage of carbon dioxide based on thermal measurements and reservoir simulations. They are world leaders in this area as supported by their unique participation in this CSLF project.

Highly effective and efficient science and technology project/program planning and management have been provided by the researchers. This is supported by the high quality Field Work Proposal submitted, the annual reporting of project status, and the leveraging/synergy with other areas of research in the C02SINK Germany storage demonstration project. In addition, the researchers have been able to meet milestones under FY budget constraints.

Further details are elaborated on in 3.1, 3.2, and 3.3

### **Objective 3.1 Provide Effective and Efficient Stewardship of Scientific Capabilities and Program Vision**

Score: 4.0

Grade: A

Weighting: 40 **Objective**

#### **3.1 Performance Summary Statement:**

The researchers have provided effective and efficient stewardship of scientific capabilities and program vision. This is supported by the following achievements.

- Efficiency and effectiveness of joint planning with outside community.
- Articulation of scientific vision.
- Development of core competencies.

Highly efficient and effective joint planning with the outside scientific community is demonstrated by their participation in the CSLF-endorsed C02SINK project in Germany that is funded by the European Commission.

The researchers have articulated scientific vision well with respect to their specialty of development and application of monitoring tools for geologic storage of carbon dioxide based on thermal measurements and reservoir simulations. They are world leaders in this area as supported by their unique participation in this CSLF projects.

Core competencies have been developed in these research areas of applying petrophysics, reservoir simulations, and seismic experimental studies to monitoring geologic storage of carbon dioxide as a GHG mitigation technology.

### **Objective 3.2 Provide Effective and Efficient Science and Technology Project/Program Planning and Management**

Score: 4.0

Grade: A

Weighting: 30 **Objective**

#### **3.2 Performance Summary Statement:**



Highly effective and efficient science and technology project/ program planning and management have been provided by the researchers. This is supported by the high quality Field Work Proposal submitted, the annual reporting of project status, and the leveraging/synergy with other areas of research in the C02SINK Germany project. In addition, the researchers have been able to meet milestones under FY budget constraints.

**Objective 3.3 Provide Efficient and Effective Communications and Responsiveness to Customer Needs**

Score: 4.0

Grade: A

Weighting: 30 **Objective**

**3.3 Performance Summary Statement:**

Highly efficient and effective communications, as well as high responsiveness to the DOE customer, is provided. The researchers provide high quality, accurate, and timely responses to DOE and other stakeholder requests. Examples include timely and high quality responses to calls for annual Field Work Proposals and special requests for project status information. Communications channels are well-defined and there is good interaction between researchers and the DOE Project Manager with respect to project status and project planning.

**Laboratory Year-End Performance Assessment Report**

Date: 10/29/2008

Headquarters Program Office Fiscal Year 2008 Evaluation of Science and Technology Program Performance at the Lawrence Berkeley National Laboratory: FWP LBL-8-G204, GFO-SEQ

Agency: U.S. Department of Energy

Program Office: Assistant Secretary for Fossil Energy

FY Funding Level: (Budget Authority) \$1,500,000; B&R 3010000

**Goal 1.0 Provide for Efficient and Effective Mission Accomplishment** Goal Score: 4.3

Goal Grade: A+ **Goal 1.0 Performance**

**Summary Statement:**

LBNL has continued to produce high-quality, original, and creative results that advance science and technology; demonstrated sustained scientific progress and impact; received high external recognition of accomplishments; and have made step-change contributions to research and development goals of the Department and its customers. The following achievements are provided as support.

The science and technology results of the researchers have continued to provide high and meaningful impact on the field. The researchers continue to contribute to DOE's Carbon Sequestration Program that supports the Global Climate Change Initiative by conducting studies that focus on the Greenhouse Gas (GHG) mitigation technology of geologic storage of carbon dioxide (G02). This effort is a Presidential Initiative. LBNL researchers are investigating carbon dioxide storage processes and mechanisms through: (1) developing field and computational methods to improve predictions of injectivity and capacity of saline formations and depleted gas reservoirs; and (2) developing and testing innovative high-resolution methods for monitoring carbon dioxide in the [subsurface](#). In this project, LBNL leverages scientific understanding and technology development from three highly visible ongoing world-class geologic CO2 storage projects (all three are Carbon Sequestration Leadership Forum (CSLF) recognized) through leadership and collaboration in the scientific and engineering objectives. The CSLF is a major international initiative for DOE, and LBNL is providing step-change contributions leading to the success of these CSLF-endorsed projects.



The three CSLF-endorsed projects are the: (1) Frio, Texas Brine Pilot Tests; (2) Australian Otway Basin Pilot Project; and (3) In Salah, Algeria Industrial-Scale CO<sub>2</sub> Storage Project. Within these projects, LBNL has led the development of downhole fluid and gas sampling by U-tube, downhole Continuous Active Source Seismic Monitoring (CASSM), Vertical Seismic Profiling (VSP), microseismic monitoring, satellite-based InSAR and other techniques, and development of reservoir simulation capabilities incorporating reactive geochemistry, multicomponent gas mixtures, and geomechanical coupling. Advances derived From LBNL's efforts also support the DOE Regional Partnership Projects through the involvement of the investigators, and will likely be used in commercial-scale CO<sub>2</sub> operations in the future.

The impact on DOE, and its mission for GHG mitigation has been enormous because LBNL researchers are developing new tools and methodologies for geologic storage, and successfully applying them. They are also representing the U.S. and DOE's science expertise in the above-named international projects, and are fully engaged with international colleagues on the design, field testing, and analyses of results.

The researchers are highly successful stewards in the research for geologic storage of carbon dioxide. Their work on numerous types of seismic monitoring, as well as development of U-tube for reservoir fluid sampling are just Several examples. The development of these and other tools and techniques are likely to become standards and widely used in the Scientific Community. in addition, they are resolving- critical questions and moving the research area forward. For example, they are continuing to answer the question "can the injected carbon dioxide Plume and reservoir be remotely monitored with adequate resolution" with techniques such as crosshole seismic tomography, VSP, and satellite-based InSAR.

The results of their research have generated huge interest/enthusiasm In the field; the request for their continued participation in numerous international projects listed above is just One supportive achievement\_

Additional details of achievements are elaborated on in 1.1, 1.2, and 1.3.

### **Objective 1.1 Science and Technology Results Provide Meaningful Impact on the Field**

Score: 4.3

Grade: A+

Weighting: 25

#### **Objective 1.1 Performance Summary Statement:**

The science and technology results of the researchers continue to provide high and meaningful impact on the field. The following achievements are noted as support.

- The researchers continue to contribute to DOE's Carbon Sequestration Program that supports the Global Climate Change initiative by conducting studies that focus on the Greenhouse Gas (GHG) mitigation technology of geologic storage of carbon dioxide. This effort is a Presidential Initiative. LBNL researchers are investigating carbon dioxide storage processes and mechanisms through: (1) developing field and computational

methods to improve predictions of injectivity and capacity of saline formations and depleted gas reservoirs, and (2) developing and testing innovative high-resolution methods for monitoring carbon dioxide in the subsurface. In this project, LBNL leverages scientific understanding and technology development from three highly visible ongoing world-class geologic CO<sub>2</sub> storage projects (all three are Carbon Sequestration Leadership Forum (CSLF)-recognized) through leadership and collaboration in the scientific and engineering objectives. The CSLF is also an important initiative for DOE, and LBNL is providing step-change contributions leading to the success of these CSII--endorsed projects.

The three CSLF projects are the: (1 ) Frio, Texas Brine Pilot Tests; (2) Australian Otway Basin Pilot Project; and (3) In Salah, Algeria Industrial-Scale CO<sub>2</sub> Storage Project. Within these projects, LBNL has led the development of downhole fluid and gas sampling by U-tube, downhole Continuous Active Source Seismic





Monitoring (CASSM), Vertical Seismic Profiling, microseismic monitoring, satellite-based InSAR and other techniques, and development of reservoir simulation capabilities incorporating reactive geochemistry., multicomponent gas mixtures, and geomechanical coupling. Advances derived from LBNL's efforts also support the DOE Regional Partnership Projects through the involvement of the investigators, and will likely be used in commercial-scale CO<sub>2</sub> operations in the future.

- The Impact on DOE and its mission for GHG initiation, has been enormous because LBNL researchers are developing new tools and methodologies for geologic storage, and successfully applying them. They are also representing the U.S. and DOE's science expertise in the above-named international projects, and are fully engaged with international colleagues on the design, field testing, and analyses of results.
- The researchers are highly successful stewards in the research for geologic storage of carbon dioxide. Their work on numerous types of seismic monitoring, development of U-tube for reservoir fluid sampling, and use of InSAR satellite-based data to monitor CO<sub>2</sub> reservoirs are just several examples. The development of these and other tools and techniques are likely to become standards and widely-used in the scientific community. In addition, they are resolving critical questions and moving the research area forward. For example, they are answering ~ the question "can the injected carbon dioxide plume be remotely monitored with adequate resolution" with techniques such as crosshole seismic tomography.
- The results of their research have generated huge interest/enthusiasm in the field; the request for their continued participation in numerous international projects listed above is just one supportive achievement.
- LBNL excels in making high-quality data available to the scientific community. This achievement is supported by an extensive list of publications, invited talks, and other technology transfer. These have generated high impact on the field. Several supportive achievements follow.

Through extensive collaboration with the CO<sub>2</sub>CRC team for the Otway, Australia injection project, the researchers completed this year design and deployment of the Naylor-1 observation well bottom hole assembly and borehole monitoring instrumentation. This was a major milestone for this high profile international Australian project.

- b. Through extensive collaboration with the CO<sub>2</sub>CRC team for the Otway, Australia injection project the researchers have supported the team and project through baseline data acquisition and, upon commissioning of the CO<sub>2</sub> injection operations in April, the monitoring of the injected CO<sub>2</sub>. This was done by continued support for the seismic, U-tube sampling, and tracer injection. The researchers also supported tile commissioning ceremonies in April. The project has been so successful, the second Phase is now being planned, and the researchers have been invited to Contribute to tile Phase 2, that is now underway.

Through extensive collaboration with the InSalah, Algeria CO<sub>2</sub> storage project industry operator, BP, the researchers have completed a study that uses satellite-based InSAR observations to monitor the reservoir and overburden. The results have been published in two benchmark papers in Geophysics. The study is likely to bring great interest to the scientific community for this monitoring tool.

- d. Continued to complete an extensive list Of publications and presentations that have had high impact on the field; a partial list includes the following:

Vasco, D.W., Ferretti, A., and Novali, 2008, Reservoir monitoring and characterization using satellite geodetic data: Interferometric Synthetic Aperture Radar observations from the Krechba Field, in press, Geophysics, November 2008 issue.

Vasco, D. W., Ferratti, A., and Novali, F., 2008, Estimating permeability from quasi-static deformation: Temporal variations and arrival time inversion, in press, Geophysics, November 2008 Issue.



T.M. Daley, I. Sherlock, B. Freifeld, J. Ajo-Franklin, and S. Sharnia. "Monitoring of CO<sub>2</sub> Sequestration in a Depleted Gas Reservoir: The Otway Project," presented at the Society of Exploration Geophysics Summer Research Workshop, Vancouver, Sept. 11, 2008.

Thomas Daley, Don Sherlock, Barry Freifeld, and Sandeep Sharma, 2008, Otway Project: Multi-Purpose Borehole Seismic Sensors - Design, Installation, and Preinjection Monitoring Data, DOE/NETL Seventh Annual Conference on Carbon Capture and Sequestration, Pittsburgh, Pennsylvania, May 5-8, 2008.

Barry Freifeld, Thomas Daley, Sandeep Sharma, and Jim Underschultz, 2005, Design and Installation of an Integrated Well-Based Monitoring Program at Otway Basin, Victoria, Australia, DOE/NETL Seventh Annual Conference on Carbon Capture and Sequestration, Pittsburgh, Pennsylvania, May 5-8, 2008.

Jonathan Ajo-Franklin, 2008, Combining Analysis of Continuous Active-Source Seismic Monitoring and Multiphase Flow Modeling for CO<sub>2</sub> Sequestration: The Frio 11 Brine Pilot, DOE/NETL Seventh Annual Conference on Carbon Capture and Sequestration, Pittsburgh, Pennsylvania, May 5-8, 2008.

Underschultz, J., Freifeld, B., Boreham, C., Stalker, L., Schacht, U., Perkins, E., Kirste, D., and Sharma, S. "Geochemistry Monitoring of CO<sub>2</sub> storage at the CO<sub>2</sub>CRC Otway Project, Victoria." 2008 Australian Petroleum Production & Exploration Association Conference, 6 April, 2008 Perth, Australia.

T. Daley, Seismic based MMV Programs: Frio II, Otway Basin, Permian EOR, WESTCARB/SECARF3, presented at the IEA GHG R&D Programme 4<sup>th</sup> Monitoring Network Meeting, Edmonton, Canada, November 2007.

Daley, T.M., R.D. Solbau, J.B. Ajo-Franklin, S.M. Benson, 2007, Continuous active-source monitoring of CO<sub>2</sub> injection in a brine aquifer, *Geophysics*, v.72, n.5, p.A57-A67, DOI 10.1190/1.2754716

Daley, T.M., Myer, L.R., Peterson, J.E., Viajer, E.L., Hovcrslen, G.M., 2007, Time-lapse crosswell seismic and VSP monitoring of injected CO<sub>2</sub> in a brine aquifer, *Environmental Geology*, DOI 10.1007/s00254-007-0943-r.

Doughty C, Freifeld BM, Trautz RC, 2007, Site characterization For CO<sub>2</sub> geologic storage and vice versa: the Frio brine pilot, Texas, USA as a case study. *Environmental Geology*, DOI 10.1007/s00254-007-0942-0.

Ajo-Franklin, J.B., Minsley, B.J. and Daley, T.M., Applying Compactness Constraints To Seismic Traveltime Tomography, *Geophysics*, in review, 2007 (LBNL-60057)

Doughty, C., Modeling geologic storage of carbon dioxide: comparison of hysteretic and non-hysteretic curves, *Energy Conversion and Management*, 48, 6, 1708-1781, 2007. (LBNL61176)

Freifeld, B., Real-time quadrupole mass spectrometer analysis of gas in borehole fluid samples acquired using the U-Tube sampling methodology, *Geofluids*, G(3): 217-224, 2006 (LQNL61091).

Hovorka, S.D., S.M. Benson, C. Doughty, B.M. Freifeld, S. Sakurai, T.M. Daley, Y.K. Kharaka, M.H. Holtz, R.C. Trautz, H.S. Nance, L.R. Myer, and K.G. Knauss, Measuring the permanence of CO<sub>2</sub> storage in saline Formations: the Frio experiment, *Environmental Geosciences*, 13, 2, 1-17, 2006. (LBNL-59434)

Freifeld, B.M. et al., The U-Tube: A Novel System for Acquiring borehole Fluid Samples from a Deep Geologic CO<sub>2</sub> Sequestration Experiment, *Journal of Geophysical Research - Solid Earth*, 110: B10203, 2005 (LBNL-57117).





Xu, T, Y. Kharaka, and S. Benson, Preliminary reactive geochemical transport Modeling study on changes in water chemistry induced by CO<sub>2</sub> injection at Frio Pilot Test Site, 2006 AGU fall meeting, December 11-15, (LBNL-61677 Abs.)

Freifeld, B., Monitoring CO<sub>2</sub> geosequestration using distributed thermal measurements, DOE/NETL Sixth Annual Conference on Carbon Capture and Sequestration, Pittsburgh, Pennsylvania, May 7-10, 2007.

Daley, T.M., R.D. Solbau, J.B. Ajo-Franklin, S.M. Benson, 2007, Continuous Crosswell Seismic During CO<sub>2</sub> Injection: A New Monitoring Technology Deployed at the Frio-11 Experiment, Sixth Annual Conference on Carbon Capture and Sequestration, paper #143, May 7-10, 2007.

Daley, T., Solbau, R., Ajo-Franklin, J., and Benson, B. "Continuous crosswell monitoring of CO<sub>2</sub> injection in a brine aquifer" Paper TL3.6, p. 2949-2953, 77th Ann. Internat. Mt.: Soc. of Expl- Geophys, San Antonio, TX, September 2007

Hovorka, Susan D., Thomas M. Daley, Barry M. Freifeld, Jeff Kane, Yousif K. Kharaka, Sally M. Benson, Tommy J. Phelps, Gary Pope, Jonathan Ajo-Franklin, Christine A. Doughty, Kevin Knauss, James Underschultz, Testing Interactions of Buoyancy, Multiphase Flow and Geochemistry: Preliminary Results from the Frio-II Test, Sixth Annual Conference on Carbon Capture and Storage, May 7-10, 2007.

Ajo-Franklin, J. & Daley, T. "Monitoring Subsurface CO<sub>2</sub> Sequestration Using Timelapse Tomography: Results from the Frio Pilot Experiments.- CO<sub>2</sub> Sequestration Monitoring : Post-Convention Workshop 77th Ann. Internat. Mt., Soc. of Expl Geophys, San Antonio, TX, September 2007

## **Objective 1.2 Provide Quality Leadership in Science and Technology**

Score: 4.3

Grade: A+

Weighting: 25 **Objective 1.2**

### **Performance Summary Statement:**

The researchers have continued to provide high quality leadership in science and technology. Research results have had high and meaningful impact on the field. The following achievements are provided as support.

The LBNL scientific research pursued is unique and a challenge with respect to monitoring geologic storage as a GHG mitigation technology. The lab is a trendsetter in the field with respect to the scientific approach and application of geophysics, geochemistry, and simulations; these approaches are proving to be critical tools to verify safe and permanent storage in the subsurface. They are in a leadership role in these specialized studies and their excellence is demonstrated in numerous ways described in 1.1, including the following:

The researchers have played instrumental roles in three CSLF-endorsed projects: (1) Frio, Texas Brine Pilot Tests; (2) Australian Otway Basin Pilot Project; and (3) In Salah, Algeria Industrial-Scale CO<sub>2</sub> Storage Project. Within these projects, LBNL has led the development of downhole fluid and gas sampling by U-tube, downhole Continuous Active Source Seismic Monitoring (CASSM), VSP, microseismic monitoring, tracer injection and reservoir monitoring, satellite-based InSAR observations, and other geophysical techniques, and reservoir simulation capabilities incorporating reactive geochemistry, multicomponent gas mixtures, and geomechanical coupling. Advances derived from LBNL's efforts also support the DOE Regional Partnership Projects through the involvement of the investigators, and will likely be used in commercial-scale CO<sub>2</sub> operations in the future.

As Supported above and in 1.1, LBNL has achieved the following.

- LBNL researchers have pursued novel approaches and demonstrated innovative solutions to problems.



- ,BNL researchers have addressed high-risk/high payoff/long-term research problems.
- Their approaches to science addressing geologic storage are unique and a challenge,
- LRNL is recognized for doing the best work in the field.
- LBNL researchers have collaborated extensively with both U.S. and international colleagues working on geologic storage of carbon dioxide.
- Lk3NL staff members are visible in leadership positions in the scientific community.
- l.F3NL have been very effective in driving the direction and setting the priorities of the research community.
- LBNL is a trendsetter in [lie field.

### **Objective 1.3 Provide and Sustain Science and Technology Outputs that Advance Program Objectives and Goals**

Score: 4.3

Grade: A+

Weighting: 25 **Objective**

#### **1.3 Performance Summary Statement:**

This research provides and sustains science and technology outputs that advance program objectives and goals. This is supported by:

- The number of publications in peer-reviewed journals (see list provided in 1.1 ).
- The quantity of output from applied field and computational research.

The LBNL researchers are part of the benchmark Frio, Texas pilot study that is a CSLF -endorsed project and has international participation and recognition. Their expertise continues to be sought after for participation in other key carbon dioxide geologic storage projects.

h. The LBNL researchers are part of the Australian Otway pilot geologic storage project.

This is CSLF-endorsed project and has international participation and recognition. C. The LBNL researchers are part of the Algerian In Salah Joint Industry commercial scale which is also a CSLF-endorsed project.

- Demonstrated progress against peer reviewed recommendations. As part of the Frio, Texas pilot team, the researchers collaborated extensively with their peer researchers in the design and conduct of the fieldwork, analyses of the field data, and publications that resulted. As part of the Australian Otway project and the Algerian In Salah project, they have also collaborated extensively with their peer researchers on these teams.

### **Objective 1.4 Provide for Effective Delivery of Science and Technology**

Score: 4. 3)

Grade: A+

Weighting: 25 **Objective 1.4**

#### **Performance Summary Statement:**

The researchers have been very effective and efficient in the delivery of the science. This has been demonstrated by the following achievements.

- Effective in meeting goals and milestones such as the FY08 FWP quarterly project milestones that are reported on by the program.
- Effective in FY08 FWP reporting and providing necessary DOE documents for strategic planning. Effective



in delivering on promises; LBNL researchers have showcased 1 ~.5. and DOE scientific expertise in numerous international project including Frio, Australian Otway, and Algerian In Salah.

- Effectively transmitting results to the scientific community as supported by numerous peer reviewed publications and extensive collaboration with peer-researchers in carbon sequestration (see 1.1 ).

## **Goal 2.0 Provide for Efficient and Effective Design, Fabrication, Construction and Operation of Research Facilities** *(Not applicable to FE)*

## **Goal 3.0 Provide Effective and Efficient Science and Technology Program Management**

Goal Score: 4.3

Goal Grade: A+

### **Goal 3.0 Performance Summary Statement:**

L.RNI, provides highly effective program vision and leadership; strategic planning and development of initiatives; and retains a high quality scientific workforce. The researchers provide a high degree of effective and efficient science and technology research project/program management. This is demonstrated by achievements in the following.

Highly efficient and effective joint planning with the outside scientific community is demonstrated by their participation in the research teams for the Frio pilot project, the Australian Otway project, and the Algerian In Salah project. All three projects are endorsed as Carbon Sequestration Leadership Forum projects and have international participation and recognition; results are being provided to the U.S. and international community. Other supportive examples of Joint planning are provided in 1.1.

The researchers have articulated scientific vision well with respect to their specialty of development and application of monitoring tools for geologic storage of carbon dioxide based on geophysics, geochemistry, and simulations. They are world leaders in this area as supported by their unique participation in these CSLV projects, as well as the invitation to participate in similar geologic storage projects. Their articulation of the science is Supported by the numerous publications as provided in 1. [.

Highly effective and efficient science and technology project/program planning and management have been provided by the researchers. This is supported by the high quality Field Work Proposal submitted, the annual reporting of project status, and the leveraging/synergy with other areas of research including the Frio injection pilot study, the Australian Otway project, and the Algerian In Salah project. In addition, the researchers have been able to meet milestones under FY budget constraints.

Further details are elaborated on in 3.1, 3.2, and 3.3

### **Objective 3.1 Provide Effective and Efficient Stewardship of Scientific Capabilities and Program Vision**

Score: 4.:

Grade: A+

Weighting: 40

### **Objective 3.1 Performance Summary Statement:**



The researchers have provided effective and efficient stewardship of scientific capabilities and program vision. This is supported by the following achievements.

- Efficiency and effectiveness of joint planning with outside community.
- Articulation of scientific vision.
- Development of core competencies.

highly efficient and effective joint planning with the outside scientific community is demonstrated by their participation in the research teams for the Frio pilot project, the Australian Otway project, and the Algerian In Salah project. All three projects are endorsed as Carbon Sequestration Leadership Forum projects and have international participation and recognition; results are being provided to the U.S. and international community. Other supportive examples of joint planning are provided in 1.1.

The researchers have articulated scientific vision well with respect to their specialty of development and application of monitoring tools for geologic storage of carbon dioxide based on geophysics, geochemistry, and simulations. They are world leaders in this area as supported by their unique participation in these CSLF projects, as well as the invitation to participate in similar geologic storage projects. Their articulation of the science is supported by the numerous publications as provided in 1.1.

Core competencies have been developed in these research areas of applying geophysics, geochemistry, and simulations for monitoring geologic storage of carbon dioxide as a GHG mitigation technology.

### **Objective 3.2 Provide Effective and Efficient Science and Technology Project/Program Planning and Management**

Score: 4.3

Grade: A~~

Weighting: 10 **Objective**

#### **3.2 Performance Summary Statement:**

Highly effective and efficient science and technology project/program planning and management have been provided by the researchers. This is supported by the high quality (Field Work Proposal submitted, the annual reporting of project status, and the leveraging/synergy with other areas of research including the Frio injection pilot study, the Australian Otway project, and the Algerian In Salah project. In addition, the researchers have been able to meet milestones under FY budget constraints.

### **Objective 3.3 Provide Efficient and Effective Communications and Responsiveness to Customer Needs**

Score: 4.3

Grade: A+

Weighting: 30 **Objective**

#### **3.3 Performance Summary Statement:**

Highly efficient and effective communications, as well as high responsiveness to the DOE customer, is provided. The researchers provide high quality, accurate, and timely responses to DOE and other stakeholder requests. Examples include timely and high quality responses to calls for annual Field Work Proposals and special requests for project status information. Communications channels are well-defined and there is good interaction between researchers and the DOE Project Manager with respect to project status and project planning.

## **Laboratory Year-End Performance Assessment Report**



Date: October 23, 2008

Headquarters Program Office Fiscal Year 2008 Evaluation of Science and Technology Program Performance at the Lawrence Berkeley National Laboratory

Agency: U.S. Department of Energy

Program Office: Assistant Secretary for Fossil Energy

FY Funding Level: (Budget Authority) 1610248/AA2530 Innovative Concepts

### **Goal 1.0 Provide for Efficient and Effective Mission Accomplishment Goal 1.0**

#### **Performance Summary Statement:**

The LBNL research team led by Dr. Steven Visco, funded under this Field Work Proposal, has been successful in addressing specific R&D issues (or the Department's Solid State Energy Conversion Alliance (SECA) Program project portfolio. The team's work on infiltrating solid oxide fuel cell (SOFC) electrodes with catalysts has been particularly noteworthy. The team has also aided the SECA program through the design of a standardized cell testing platform, collaboration with U.S.-based SOFC manufacturers (both small businesses and SECA Industry Teams), and generally advancing the state-of-the-art within the SOFC community.

#### **Objective 1.1 Science and Technology Results Provide Meaningful Impact on the Field**

Score: 4.0

Grade: A

Weighting: 25 **Objective 1.1 Performance**

#### **Summary Statement:**

The work at LBNL by Dr. Visco's team has continued to provide significant advances in SOFC component development. Specifically, the infiltration of catalysts into SOFC electrodes and the investigation of interconnect coatings has accelerated technology advancement.

#### **Objective 1.2 Provide Quality Leadership in Science and Technology**

Score: 4.0

Grade: A

Weighting: 25

#### **Objective 1.2 Performance Summary Statement:**

Dr. Steven Visco is one of the leaders in the field of SOFC catalyst infiltration and interconnect coating development. Dr. Visco's team routinely addresses SOFC R&D needs through the development and evaluation of creative solutions. He has established and maintained good working relationships with the SECA Industry Teams as well as Core Technology Program peers. The project is currently developing mitigation strategies for addressing potentially deleterious interactions between coal contaminants and SOFC anodes, a high priority within the SECA program. The infiltration work has provided substantial results impacting the SECA program.

#### **Objective 1.3 Provide and Sustain Science and Technology Outputs that Advance Program Objectives and Goals**



Score: 4.0

Grade: A

Weighting: 25 **Objective**

**1.3 Performance Summary Statement:**

The project has exceeded all programmatic objectives. Output has been excellent [-()r the level of finding. Work and output continues to generate SECA Industry Team interest. This research team routinely publishes results in high-quality journals and presents those results at technical conferences, SECA workshops, and DOE-organized Peer Reviews. Comments have generally been highly complimentary.

**Objective 1.4 Provide for Effective Delivery of Science and Technology**

Score: 3.8

Grade: A

Weighting: 25 **Objective 1.4**

**Performance Summary Statement:**

LBNL's work on interconnect coatings and infiltration catalysts has been valuable to the SOFC community. It has been widely disseminated through technical journals and conferences. The L13NIL team has produced high-quality results through an efficient use of tax-payer capital. DOE Programmatic requests are generally responded to in an effective manner.

**Goal 2.0 Provide for Efficient and Effective Design, Fabrication, Construction and Operation of Research Facilities** *(Not applicable to FF)*

**Goal 3.0 Provide Effective and Efficient Science and Technology Program Management**

**Goal 3.0 Performance Summary Statement:**

Overall, the LBNL effort lead by Dr. Steven Visco is well-led, and accomplishes planned technical objectives and milestones in an effective and efficient manner.

**Objective 3.1 Provide Effective and Efficient Stewardship of Scientific Capabilities and Program Vision**

Score: 3.8

Grade: A

Weighting: 40 **Objective**

**3.1 Performance Summary Statement:**

Technical capabilities and results are valued by SECA Program Management. Relevant core competencies are well-established.

**Objective 3.2 Provide Effective and Efficient Science and Technology Project/Program Planning and Management**

Score: ".8

Grade: A

Weighting~: 30

**Objective 3.2 Performance Summary Statement:**



R&D work is of excellent quality and is managed well. The LBNL team accomplishes what it states it will (to). In particular, the LBNL team does an excellent job of leveraging resources from other projects to aid in the advancement of Office of Fossil Energy SOFC- related objectives.

**Objective 3.3 Provide Efficient and Effective Communications and Responsiveness to Customer Needs**

Score: 3.5

Grade: A-

Weighting: 30

**Objective 3.3 Performance Summary Statement:**

Responses to DOE requests for information are generally timely and of high-quality. LBNL is generally responsive to programmatic direction.

**Laboratory Year-End Performance Assessment Report**

Date: 10/30/08

Headquarters Program Office Fiscal Year 2008 Evaluation of Science and Technology Program Performance at the Lawrence Berkeley National Laboratory

.Agency. U.S. Department of Energy

Program Office: Assistant Secretary for Fossil Energy FY Funding Level: (Budget Authority) \$200,000

**Goal 1.0 Provide for Efficient and Effective Mission Accomplishment Goal Score: 4.0**

Goal Grade: A

**Goal 1.0 Performance Summary Statement:**

Because I do not have LBNL laboratory-level exposure, my experience with and evaluation of LBNL in FY08 is limited to two Field Work Proposal projects with Dr. Ted Chang, Principal Investigator: 4738 for oxidation of mercury by gaseous oxidants in coal-fired flue gas, and C,D33EE for reducing the cost of CO<sub>2</sub> removal from coal-fired flue gas in amine- and other aqueous-based scrubbing processes. For his accomplishments described in 1.1 below, Ted Chang won LBNL's Technology Transfer award in 2007. As described in 1.3, Ted has been an invited lecturer at international conferences, and he submitted two articles in FY08 for publication in peer-reviewed scientific journals.

In FY08, LBNL delivered their final report for Project 4738 on mercury control technology. Because of a Federal Continuing Resolution in FY08, LBNL did not receive DOE funding to start ED33EF for post-combustion CO<sub>2</sub> capture technology until mid-May 2008. LBNL plans to complete set-up of their experimental equipment and begin parametric testing of an amine-based CO<sub>2</sub> removal process in November 2008. LBNL plans to finish the FY08 scope within their proposed 12-month schedule, and has prepared a draft FWP to add new FY09 scope to their CO<sub>2</sub> removal investigation.

**Objective 1.1 Science and Technology Results Provide Meaningful impact on the Field**

Score: 4.0

Grade: A

Weighting: 25

**Objective 1.1 Performance Summary Statement:**





LBNL, previously developed a process for gaseous oxidation of mercury in power plant flue gas with co-removal of oxidized mercury in wet Flue Gas Desulfurization systems. LBNL estimates their mercury oxidation/removal process will cost less than \$10,000 per lb of mercury removed, which is well under DOE goals of 25% to 50% of the baseline cost of \$60,000 per lb of mercury removed. LBNL applied for a patent for their gaseous process to oxidize mercury in power plant flue gas, and developed an industrial partnership with Mobotec for commercial testing of their process to oxidize mercury with gaseous oxidants. LBNL is also licensing DOE-sponsored technology for control of mercury and SO<sub>2</sub> in coal-fired flue gas, a direct result of working with NETL in the IEP Program. Ted Chang won LBNL's Technology Transfer award in December 2007.

LBNL's current investigation on CO<sub>2</sub> removal has targeted 90% removal at a cost not to exceed a 20% increase in the Cost of Electricity compared to a power plant with no CO<sub>2</sub> capture. If successful, this will meet or exceed the Fossil Energy CO<sub>2</sub> Capture Program goals for existing coal-fired power plants.

Ted Chang reported that:

1. LBNL has worked with industries (Bechtel, Parsons, and Dow Chemicals), and academics (Tokyo Institute of Technology, Japan; Academic Sinica, China; Peking University, China; Zhejiang University, China; Shanghai Jiao Tong University, China; Cheng-Kung University, Taiwan.
2. Ted has been invited to present papers at International Conferences and Meetings. He was an invited lecturer on "Developing Technologies for the Control of Mercury Emissions from Coal-Fired Power Plants," at Department of Environmental Engineering, National Taiwan Cheng-Kung University, Tainan, Taiwan, Nov. 13-16, 2006. Ted was also an invited lecturer on "The Role of Halides on Hg<sup>0</sup> Removal from Coal-Fired Flue Gas by Carbonaceous Materials," at Department of Environmental Engineering, National Taiwan Cheng-Kung University, Tainan, Taiwan, May 14, 2008.

#### **Objective 1.2 Provide Quality Leadership in Science and Technology**

Score: 4.0

Grade: A

Weighting: 25

##### **Objective 1.2 Performance Summary Statement:**

LBNL has been a consistent contributor in the development of innovative technology to control air emissions from coal-fired power plants. As Fossil Energy's R&D funding has shifted from mercury control to CO<sub>2</sub> control, LBNL adapted and provided meaningful bench-scale research to support changing R&D needs.

#### **Objective 1.3 Provide and Sustain Science and Technology Outputs that Advance Program Objectives and Goals**

Score: 4.0

Grade: A

Weighting: 25 **Objective**

##### **1.3 Performance Summary Statement:**

Ted Chang has been a regular poster presenter at Innovations for Existing Plants Annual Technology Conferences, and contributed the following articles which were submitted for publication in peer-reviewed scientific journals:

N.Q. Yan, Z. Qu, Y. Chi, S.H. Qiao, R. L. Dod, S.G. Chang, and C. Miller, "Enhanced Elemental Mercury Removal from Coal-fired Flue Gas by Sulfur-chlorine Compounds," submitted for publication, 2008

Z. Qu, N.Q. Yan, J. J. Chang, S.G. Chang, and C. Miller, "The Role of Halide on Hg<sup>0</sup> Removal from Coal-fired Flue Gas by Carbonaceous Materials," submitted for publication, 2008





These articles publicly reported the work performed under the DOE/Fossil Energy/mercury Control technology Program.

**Objective 1.4 Provide for Effective Delivery of Science and Technology**

Score: 4.0

Grade: A

Weighting: 25 **Objective 1.4**

**Performance Summary Statement:**

As described in 3.0 below, LBNL completed their work on annual Field Work Proposals within 12 months of receiving DOE funding. Ted Chang, the PI, has willingly accommodated my requests and technical direction. Ted submitted his quarterly and final reports to NETL in a timely manner.

**Goal 2.0 Provide for Efficient and Effective Design, Fabrication, Construction and Operation of Research Facilities** (*Not applicable to FF.*)

**Goal 3.0 Provide Effective and Efficient Science and Technology Program Management**

Goal Score: 4.2

Goal Grade: A+

**Goal 3.0 Performance Summary Statement:**

Ted Chang of LBNL effectively managed multiple Field Work Proposals during the transition between mercury R&D and CO<sub>2</sub> capture R&D in FY08. They accomplished the work proposed in each annual Field Work Proposal within 12 months of receiving DOE funding. When DOE/IEP funding for mercury control research was eliminated, LBNL adapted well by submitting an hY08 Field Work Proposal and initiated bench-scale research in CO<sub>2</sub> post combustion capture. By not duplicating the work of others, they used DOE funding in a cost-effective way to broaden the emissions control options available to power plant owners. They independently developed and proposed an innovative idea for improvement of post-combustion ('O<sub>2</sub>) capture technology. Ted Chang has effectively served as my single point of contact with IANI :, and responded to my customer needs in a timely manner. He has efficiently and effectively communicated with me via E-mail, telephone, face-to-face conversations, and written proposals and progress reports.

**Objective 3.1 Provide Effective and Efficient Stewardship of Scientific Capabilities and Program Vision**

Score: 4.0

Grade: A

Weighting: 40 **Objective**

**3.1 Performance Summary Statement:**

LBNL proposed uniquely innovative technology for mercury control and for CO<sub>2</sub> capture. By not duplicating the work of others, they used DOE funding in a cost-effective way to broaden the emissions control options available to power plant owners. They independently developed and proposed an innovative idea for improvement of post-combustion CO<sub>2</sub> capture technology,

**Objective 3.2 Provide Effective and Efficient Science and Technology Project/Program Planning and Management**

Score: 4\_3

Grade: A+

Weighting: 30 **Objective**

**3.2 Performance Summary Statement:**



LBNL carefully planned their work and documented the plan in their Field Work Proposals. They proactively identified potential problems and risks, and dealt with unplanned occurrences as they developed. They accomplished the work proposed in each annual Field Work Proposal within 12 months of receiving DOE funding. When DOE/IEY funding for mercury control research was eliminated, LBNL adapted well by submitting an FY08 Field Work Proposal and initiated bench-scale research in CO, post-combustion capture.

**Objective 3.3 Provide Efficient and Effective Communications and Responsiveness to Customer Needs**

Score: 4.3

Grade: A+

Weighting: 30 **Objective 3.3**

**Performance Summary Statement:**

Ted Chang of LBNL has effectively served as my single point of contact with LBNL, and responded to my customer needs in a timely manner. He has efficiently and effectively communicated with me via E-mail, telephone, face-to-face conversations, and written proposals and progress reports. Ted has proactively advised me of potential problems and the range of outcomes.

**Laboratory Year-End Performance Assessment Report**

Date: 11-6-08

Headquarters Program Office Fiscal Year 2008 Evaluation of Science and Technology Program Performance at the Lawrence Berkeley National Laboratory

Agency: U.S. Department of Energy

Program Office: Assistant Secretary for Fossil Energy

FY Funding Level: (Budget Authority) \$1,000,000

**Goal 1.0 Provide for Efficient and Effective Mission Accomplishment** Goal Score: 4.2

Goal Grade: A+ **Goal 1.0 Performance**

**Summary Statement:**

LBNL- is researching underground fate and transport of CO-, measurement and monitoring techniques to verify storage and detect leakage, and fundamental geochemical and hydrological investigations of CO, storage. Their research contributes to DOE's mission for Carbon Sequestration to assure successful CO, storage in saline formations and hydrocarbon reservoirs. Their staff is visible in the community and are regarded as leaders in the technology area. For this project, all FY2007 and FY2008 milestones were met.

**Objective 1.1 Science and Technology Results Provide Meaningful Impact on the Field**

Score: 3.8

Grade: A

Weighting: 25 **Objective 1.1 Performance**

**Summary Statement:**

LBN L's publications and results from their work on this project have made an impact on the field. Their research contributes to DOE's mission for Carbon Sequestration to assure successful CO, storage in saline formations and hydrocarbon reservoirs.



### **Objective 1.2 Provide Quality Leadership in Science and Technology**

Score: 4.3

Grade: A+

Weighting: 25

#### **Objective 1.2 Performance Summary Statement:**

LBNL collaborates with four other National Laboratories and two Universities for their work on this project. Their staff members are very visible in the community and are regarded as leaders in the technology area. They are often asked to present their research to the community and do very well.

### **Objective 1.3 Provide and Sustain Science and Technology Outputs that Advance Program Objectives and Goals**

Score: 4.3

Grade: A+

Weighting: 25

#### **Objective 1.3 Performance Summary Statement:**

The quality of their output is excellent. They contribute to the overall goals of the Program and the Project. They have demonstrated progress against peer reviewed recommendations and headquarters guidance.

### **Objective 1.4 Provide for Effective Delivery of Science and Technology**

Score: 4.3

Grade: A+

Weighting: 25 **Objective 1.4**

#### **Performance Summary Statement:**

They have demonstrated efficiency and effectiveness in meeting their goals and milestones. For this project, all FY2007 and FY2008 milestones were met.

### **Goal 2.0 Provide for Efficient and Effective Design, Fabrication, Construction and Operation of Research Facilities (Not applicable to FF.)**

### **Goal 3.0 Provide Effective and Efficient Science and Technology Program Management**

Goal Score: 43

Goal Grade: A+

#### **Goal 3.0 Performance Summary Statement:**

LBNL provides strong programmatic vision and they achieve superior scientific excellence in high-risk research that is vital to DOE's mission. LBNL contributes significantly to the success of the ZERT Project. LBNL's communication channels are well defined. Communication of project issues or results is always effective. DOE's



requests for information are always answered. LBNL expresses their concerns about their research and keeps DOE informed of all decisions. In addition, they respond to all requests in a timely manner.

**Objective 3.1 Provide Effective and Efficient Stewardship of Scientific Capabilities and Program Vision**

Score: 4.3

Grade: A+

Weighting: 40 **Objective**

**3.1 Performance Summary Statement:**

LBNL provides strong programmatic vision and they achieve superior scientific excellence in high-risk research that is vital to DOE's mission. LBNL contributes significantly to the success of the ZERT Project. LBNL is evaluating the efficacy of geologic sequestration in general as a US strategy for GHG mitigation.

**Objective 3.2 Provide Effective and Efficient Science and Technology Project/Program Planning and Management**

Score: 4.3

Grade: A++

Weighting: 30 **Objective**

**3.2 Performance Summary Statement:**

LBNL's research plans are very proactive. They are in constant contact with their COR and they plan against budget fluctuations. DOE's requests for information are always answered.

**Objective 3.3 Provide Efficient and Effective Communications and Responsiveness to Customer Needs**

Score: 4.3

Grade: A+

Weighting: 30 **Objective**

**3.3 Performance Summary Statement:**

LBNL's communication channels are well defined and always open. They express their concerns about their research and keep DOE informed of all decisions. In addition, they respond to all requests in a timely manner.

**Laboratory Year-End Performance Assessment Report**

Date: 10/20/2008

Headquarters Program Office Fiscal Year 2008 Evaluation of Science and Technology Program Performance at the Lawrence Berkeley National Laboratory

Agency: U.S. Department of Energy

Program Office: Assistant Secretary for Fossil Energy

**Goal 1.0 Provide for Efficient and Effective Mission Accomplishment**

Goal Score: 4.1

Goal Grade: A+

**Goal 1.0 Performance Summary Statement:**



The contractor produces high quality, original and creative results which are helping to truly advance hydrate science in key areas, specifically with this work in the area of hydrate role in the global environment. The researcher is well respected in his field and recognized by other experts as making real and valuable scientific contribution.

**Objective 1.1 Science and Technology Results Provide Meaningful Impact on the Field**

Score: 4.1

Grade: A+

Weighting: 25

**Objective 1.1 Performance Summary Statement:**

Work on the simulation activities related to the role hydrate plays in global climate is Cutting edge and clearly has the potential to significantly move forward the field of research in which the work is being performed.

**Objective 1.2 Provide Quality Leadership in Science and Technology**

Score: 4.1

Grade: A+

Weighting: 25

FY Funding Level: (Budget Authority) \$ 158,000

**Objective 1.2 Performance Summary Statement:**

The project PI George Moridis and support personnel are strong leaders in modeling field for methane hydrates and the adaptation to try to better define the role of hydrates in global climate through complex numerical simulations is a valuable next step in his advancement of hydrate modeling. Dr. Moridis is a trend setter in the hydrate scientific community and is performing work which is cutting edge. He is considered by experts in the field to be one of the best and most highly qualified scientists in the field of hydrate modeling.

**Objective 1.3 Provide and Sustain Science and Technology Outputs that Advance Program Objectives and Goals**

Score: 4\_3

Grade: A+

Weighting: 25 Objective

**1.3 Performance Summary Statement:**

Both the specific work and the scientists performing work under this effort have received high commendation from executed peer review of their specific work. The level and duality of publication from their efforts is considered appropriate for the work and level of funding".

**Objective 1.4 Provide for Effective Delivery of Science and Technology**

Score: 4.3

Grade: A+

Weighting": 25 Objective 1.4

**Performance Summary Statement:**

Scientists performing under this effort consistently meet or exceed planned goals and milestones within their work and are both effective and efficient in both performance of work and transmitting of results to both DOE and the greater scientific community.



**Goal 2.0 Provide for Efficient and Effective Design, Fabrication, Construction and Operation of Research Facilities** *(Not applicable to FF,)*

**Goal 3.0 Provide Effective and Efficient Science and Technology Program Management**

Goal Score: 4.0

Goal Grade: A

**Goal 3.0 Performance Summary Statement:**

Currently provide strong scientific stewardship, core competency and excellent research and scientific personnel. Personnel recruited and retained within this work are highly qualified.

**Objective 3.1 Provide Effective and Efficient Stewardship of Scientific Capabilities and Program Vision**

Score: 3.9

Grade: A

Weighting: 40 **Objective**

**3.1 Performance Summary Statement:**

Coherent programmatic vision within the laboratory. Strong core competency and currently retain talented and valuable scientific talent.

**Objective 3.2 Provide Effective and Efficient Science and Technology Project/Program Planning and Management**

Score: 3.8

Grade: A

Weighting: 30 **Objective**

**3.2 Performance Summary Statement:**

Research plans appear to include broad based expert input and plans are consistent with budgets available and well aligned with DOE interests.

**Objective 3.3 Provide Efficient and Effective Communications and Responsiveness to Customer Needs**

Score: 4.0

Grade: A

Weighting: 30 **Objective**

**3.3 Performance Summary Statement:**

The personnel under this funded effort are extremely effective at maintaining communication channels with the customer and critical information, both good and bad, are conveyed in a timely manner and in a clear and concise fashion. They are very good at keeping the DOE - NETL project manager well aware of how things are progressing within the effort.



Date: 11 /5/08

Headquarters Program Office Fiscal Year 2008 Evaluation of Science and Technology Program Performance at the Lawrence Berkeley National Laboratory

Agency: U.S. Department of Energy

Pro-gram Office: Assistant Secretary for Fossil Energy IN Funding Level:

(Budget Authority) - FY08

### **Goal 1.0 Provide for Efficient and Effective Mission Accomplishment**

Goal Score: 4

Goal Grade: A

#### **Goal 1.0 Performance Summary Statement:**

The micro-seismic project in the Bakken Shale in the Williston Basin of North Dakota was implemented to develop a better understanding of the stimulation and completion designs that are current utilized to increase oil flow from the unconventional fractured oil formations. Microseism icily has been used in the basin in an attempt to map the fractures created during stimulation. The LBL FWP provided a new methodology for tracking changes during the stimulation and the expected result would be a higher resolution capability to map micro-seismic events as the horizontal wells were stimulated with specialized fluids and sand. The particular well site-, involved in the test were part of a larger research effort to collect micro-seismic data at several levels from surface to 10,365 feet of depth at the horizontal well level. It was the perfect opportunity to compare the several types of advanced micro-seismicity instrumentation and processing, to map fractures at the reservoir level for understanding and improving both well design and stimulation technology. The LBL addition to [lie research was a unique three well design that was deployed successfully at very short notice. The 1300 to 1500 foot deep wells were successfully drilled, three sets of geophones were set at 500 foot intervals from the bottom of the well, and data was acquired from all three wells during the multiple hydraulic stimulation of two offset horizontal wells in the test area. LBL successfully accomplished data acquisition during the project and continued to monitor micro-seismic after the well clean up and for a period of oil production. The results were presented to the industry consortium and compared to the results of the other shallow vertical well, surface seismic array and deep horizontal seismic geophone data. The results are currently proprietary to the industry and will be released for the public at the end of the year. Industry was very receptive to the analysis and suggestions for future stimulations as the LBL array is permanently in place and can monitor future stimulations which are run as a normal procedure on wells in the Bakken to stimulate oil flow.

#### **Objective 1.1 Science and Technology Results Provide Meaningful Impact on the Field**

Score: 4.3

Grade: A+

Weighting: 25 **Objective 1.1 Performance**

#### **Summary Statement:**

The application of high resolution geophones in deep (1500 foot) wells was Successfully accomplished during the project to provide a more efficient data acquisition of micro-seismic events in deep (+10,000 feet) fractured reservoirs. The results of the test are providing industry with a base case example of the capabilities of the technology and it is being applied to planning future stimulation designs at this project site. The results also have shown the industry the requirements for efficiently coordinating the stimulation and data acquisition parameters in a timely manner to obtain the most accurate data. The results of this project were compared to three other micro-



seismic monitoring methods at this site For an excellent comparison of data sets From surface to shallow (250 foot) wells with single geophones and to deep 1-10,000 Foot) deployment of the latest service company geophones in a horizontal monitoring well. These results are currently being evaluated by the industry C011S0rtiLIII for application to the design of future stimulations at this project site. The success of this application will have impact in development of new geophone technology and drilling small diameter well methods that are currently being funded by DOE to make this application even more cost effective for acquisition of micro-seismic data in several energy research areas that include oil and gas, carbon sequestration and geothermal projects.

#### **Objective 1.2 Provide Quality Leadership in Science and Technology**

Score: 4.3

Grade: A+

Weighting: 25 **Objective**

##### **1.2 Performance Summary Statement:**

The geophysical research efforts at Berkeley Laboratory have provided outstanding leadership during the execution of this project. The personnel have provided professional expertise in this Field of research and have provided innovative applications to aid the development of energy resources in the US. Results have provided both government and industry participants with excellent products for future application in this project effort and their expertise has been utilized by other service companies in the micro-seismic technology area. They have provided outstanding leadership capabilities during this research effort and have made an impact on the utilization of these tools in the oil and gas industry.

#### **Objective 1.3 Provide and Sustain Science and Technology Outputs that Advance Program Objectives and Goals**

Score: 4.0

Grade: A

Weighting: 25

##### **Objective 1.3 Performance Summary Statement:**

The results from this project have and will continue to provide the industry consortium on the Bakken shale project with micro-seismic data. The application of the technology will continue to be utilized by other industry activities and DOE project in the development of oil and gas, carbon sequestration and geothermal energy research projects. The data acquired provide subsurface seismic data that can be utilized for reservoir modeling and aid in the design of more effective and cost effective well and stimulation designs in the development of these resources in the US. The results from this project will be used to model the Bakken shale reservoir formations and to develop new carbon dioxide improved oil recovery methods as part of the NETL research into fracture oil bearing formations. The expertise of the project personnel will continue to be utilized in future DOE project areas as a developing tool for evaluating energy resources.

#### **Objective 1.4 Provide for Effective Delivery of Science and Technology**

Score: 4.1

Grade: A+

Weighting: 25 **Objective 1.4**

##### **Performance Summary Statement:**

The PI has provided an excellent professional presentation to industry and government participants on this project. The industry will utilize the results in the future development of this project. A report is currently in progress as the data from the project is still proprietary to the industry participants for a few more months. The PI has provide outstanding communications with the other industry participants and NETL during the execution of this project and has provided up to date states reports as results became available.





**Coal 2.0 Provide for Efficient and Effective Design, Fabrication, Construction and Operation of Research Facilities** *(Not applicable to FF)*

**Goal 3.0 Provide Effective and Efficient Science and Technology Program Management**

Goal Score: 4.3

Goal Grade: A+

**Goal 3.0 Performance Summary Statement:**

The overall program and project management on the Bakken shale research effort was an outstanding example of the effectiveness and capabilities of the Berkeley personnel. The expertise and knowledge of the PI provided the project with the latest scientific technology being applies to this area of oil and gas upstream evaluation tools to monitor the effectiveness of well and stimulation design in unconventional fractured reservoirs. I iterate the outstanding effort of the team on this project to obtain high quality information for further development of this technology and application to DOE research projects.

**Objective 3.1 Provide Effective and Efficient Stewardship of Scientific Capabilities and Program Vision**

Score: 4.3

Grade: A+

Weighting: 40 **Objective**

**3.1 Performance Summary Statement:**

The Berkley personnel have always maintained the highest level of expertise and development of innovative geophysical capabilities and new research development in the area of subsurface seismic and its application to many of the DOE project areas including oil and gas, carbon sequestration and geothermal. They have accomplished an outstanding project effort in a very effective and efficient manner and provided future research suggestions for this particular Bakken shale reservoir monitoring project in the Williston Basin. The input is currently being used by industry to develop a future stimulation at the project site to provide more data that will be used to evaluate the reservoir and provide input to NETL reservoir modeling tasks [op further evaluation of the effectiveness of industry stimulation designs in this very large resource

**Objective 3.2 Provide Effective and Efficient Science and Technology Project/Program Planning and Management**

Score: 4.3

Grade: A+

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**Objective 3.2 Performance Summary Statement:**

The project has been planned managed, and executed in a very efficient manner and through the efforts of the Y1 was completed ahead of schedule. The project was an outstanding effort to of the necessary permits and paper work accomplished for the field work, obtain all of the necessary instrumentation, install the monitoring wells and geophones, and collect and process the micro-seismic data for presentation to the research group.

**Objective 3.3 Provide Efficient and Effective Communications and Responsiveness to Customer Needs**



Score: 4

Grade: A

Weighting: 30 **Objective**

### **3.3 Performance Summary Statement:**

There has been a consistent dialog on the status of the project and reporting of the results. All activities between all of the participants have been maintained at a high level and in a professional manner.

### **Laboratory Year-End Performance Assessment Report**

Date: 11/06/08

Headquarters Program Office Fiscal Year 2008 Evaluation of Science and Technology Program Performance at the Lawrence Berkeley National Laboratory

Agency: U.S. Department of Energy

Program Office: Assistant Secretary for Fossil Energy FY Funding Level: (Budget Authority) \$1,295,000

### **Goal 1.0 Provide for Efficient and Effective Mission Accomplishment**

Goal Score: 4.3

Goal Grade: A+

### **Goal 1.0 Performance Summary Statement:**

LBNL is performing the field activities for the WESTCARB Regional Partnership. Their publications and results have made an impact on DOE's Carbon Sequestration Program as well as their regional community. They have contributed to DOE's mission for Carbon Sequestration with this highly visible project. Their staff members are very visible in the community and are regarded as leaders in the technology area.

### **Objective 1.1 Science and Technology Results Provide Meaningful Impact on the Field**

Score: 4.3

Grade: A+

Weighting: 25

### **Objective 1.1 Performance Summary Statement:**

Their publications and results from field testing have made a major impact on the Carbon Sequestration Community as well as their local region. This Project has educated the community on Carbon Sequestration as well as provided technically input to Carbon Sequestration regulators.

### **Objective 1.2 Provide Quality Leadership in Science and Technology**

Score: 4.3

Grade: A+

Weighting: 25

### **Objective 1.2 Performance Summary Statement:**

LBNL collaborates with more than 70 partners from both public and private entities for this project. Their staff members are very visible in the community and are regarded as leaders in the technology area.



**Objective 1.3 Provide and Sustain Science and Technology Outputs that Advance Program Objectives and Goals**

Score: 4.3

Grade: A+

Weighting: 25 **Objective**

**1.3 Performance Summary Statement:**

The quality Of their output is excellent. They have been asked to represent the entire Partnership on several occasions. They have demonstrated progress against peer reviewed recommendations and headquarter guidance.

**Objective 1.4 Provide for Effective Delivery of Science and Technology**

Score: 4.3

Grade: A+

Weighting: 25 **Objective 1.4**

**Performance Summary Statement:**

They have demonstrated efficiency and effectiveness in meeting their goals and milestones. For this project, all FY2007 and FY2008 milestones were met.

**Goal 2.0 Provide for Efficient and Effective Design, Fabrication, Construction and Operation of Research Facilities** *(Not applicable to FF)*

**Goal 3.0 Provide Effective and Efficient Science and Technology Program Management**

Goal Score: 4.3

Goal Grade: A+

**Goal 3.0 Performance Summary Statement:**

LBNL provides strong programmatic vision and they achieve superior scientific excellence in high-risk research that is vital to DOE's mission. They effectively manage their injection projects through a Project Management Plan and coordination with the COR. They express their concerns or issues about any part of the project to their COR and always respond to requests in a timely manner.

**Objective 3.1 Provide Effective and Efficient Stewardship of Scientific Capabilities and Program Vision**

Score: 4.1

Grade: A+-

Weighting: 40 **Objective**

**3.1 Performance Summary Statement:**

LBNL provides strong programmatic vision and they achieve superior scientific excellence in high-risk research that is vital to DOE's mission. They effectively manage their injection projects through a Project Management Plan and coordination with the COR.



**Objective 3.2 Provide Effective and Efficient Science and Technology Project/Program Planning and Management**

Score: 4.3

Grade: A+

Weighting~: 30 **Objective**

**3.2 Performance Summary Statement:**

LBNL's research plans are detailed in several documents they submitted to their COR and they plan against budget fluctuations. They communicate with their COR on daily/weekly basis for this project.

**Objective 3.3 Provide Efficient and Effective Communications and Responsiveness to Customer Needs**

Score: 4.3

Grade: A+

Weighting: 10 **Objective**

**3.3 Performance Summary Statement:**

LBNL's communication channels are well defined. They express their concerns about their research and keep DOE informed of all decisions. In addition, they respond to all requests in a timely manner.

**Laboratory Year-End Performance Assessment Report**

Date: 10/20/08

Headquarters Program Office Fiscal Year 2008 Evaluation of Science and Technology Program Performance at the Lawrence Berkeley National Laboratory

Agency: U.S. Department of Energy

Program Office: Assistant Secretary for Fossil Energy FY Funding Level: (Budget Authority) \$430,000

**Goal 1.0 Provide for Efficient and Effective Mission Accomplishment**

Goal Score: 4.1

Goal Grade: A +

**Goal 1.0 Performance Summary Statement:**

The contractor produces high quality, original and creative results which are helping to truly advance hydrate science in key areas. The researcher is well respected in his field and recognized by other experts as making real and valuable scientific contributions.

**Objective 1.1 Science and Technology Results Provide Meaningful Impact on the Field**

Score: 4.1

Grade: A+

Weighting: 25 **Objective 1.1 Performance**

**Summary Statement:**

Work on the hydrate reservoir simulation activities is cutting edge and clearly has the potential to significantly move Forward the field of research in which the work is being performed.



### **Objective 1.2 Provide Quality Leadership in Science and Technology**

Score: 4.2

Grade: A+

Weighting: 25 **Objective**

#### **1.2 Performance Summary Statement:**

The project PI George Moridis and support personnel are strong leaders in this field. Dr. Moridis is a trend setter in the hydrate scientific community and is performing work which is cutting edge. He is considered by experts in the field to be one of the best and most highly qualified scientists in the field of hydrate modeling.

### **Objective 1.3 Provide and Sustain Science and Technology Outputs that Advance Program Objectives and Goals**

Score: 4.3

Grade: A+

Weighting- 25 **Objective**

#### **1.3 Performance Summary Statement:**

Both the specific work and the scientists performing work under this effort have received high commendation from executed peer review of their specific work. The level and quality of publication from their efforts is considered appropriate for the work and level of funding.

### **Objective 1.4 Provide for Effective Delivery of Science and Technology**

Score: 4.3

Grade: A ~

Weighting: 25

#### **Objective 1.4 Performance Summary Statement:**

Scientists performing under this effort consistently meet or exceed planned goals and milestones within their work and are both effective and efficient in both performance of work and transmitting of results to both DOE and the greater scientific community.

### **Goal 2.0 Provide for Efficient and Effective Design, Fabrication, Construction and Operation of Research Facilities** *(Not applicable to FE)*

### **Goal 3.0 Provide Effective and Efficient Science and Technology Program Management**

Goal Score: 4.0

Goal Grade: A

#### **Goal 3.0 Performance Summary Statement:**

Currently provide strong scientific stewardship, core competency and excellent research and scientific personnel. Personnel recruited and retained within this work are highly qualified.



**Objective 3.1 Provide Effective and Efficient Stewardship of Scientific Capabilities and Program Vision**

Score: 3.9

Grade: A

Weighting: 40

**Objective 3.1 Performance Summary Statement:**

Coherent programmatic vision within the laboratory. Strong core competency and currently retain talented and valuable scientific talent.

**Objective 3.2 Provide Effective and Efficient Science and Technology Project/Program Planning and Management**

Score: 3.4

Grade: B+

Weighting: 30 **Objective**

**3.2 Performance Summary Statement:**

Research plans appear to include broad-based expert input and plans are consistent with budgets available and well aligned with DOE interests.

**Objective 3.3 Provide Efficient and Effective Communications and Responsiveness to Customer Needs**

Score: 4.0

Grade: A

Weighting: 30 **Objective**

**3.3 Performance Summary Statement:**

The personnel under this funded effort are extremely effective at maintaining communication channels with the customer and critical information, both good and bad, are conveyed in a timely manner and in a clear and concise fashion. They are very good at keeping the DOE - NETL project manager well aware of how things are progressing within the effort.